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FIFTEENTH YEAR.

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OUR GREAT TRIAL OFFER.

To afford the opportunity to mechanics and others of examining and testing the value of The TRADE REVIEW AND WESTERN MACHINIST, to themselves, the Proprietor will send this Journal three months, for only FIFTY CENTS, postage paid, to any address in this country or Canada.

SCREW THREADS.

Mechanical closeness and perfection in workmanship in screw-cutting tools have been demonstrated by Sir Joseph Whitworth, in England, who has, perhaps, advanced this art more than any living person. Take his surface plates, clean and dry, place them one upon the other, and the upper one will appear to float on a thin stratum of air—expel this and you can raise the lower plate by lifting on the upper one. His standard guages, when left together a short time, lose this air cushion, and have to be driven out. This same scientific mechanic has given great attention to screw threads, and we owe the scientific system of the present day principally to him. He demonstrated that the angle of 55 degrees was the strongest, and the round top and bottom the best form of thread, and it has, consequently, been adopted by the English Government and people, and by many others elsewhere, In consequence of the difficulty of any ordinary machinist finding this angle, and the necessity of using special tools to obtain the round top and bottom, the Franklin Institute, at the instance of William Sellers, of Philadelphia, have adopted and advocated the angle of 60 degrees (the easiest of all to find). To find it, describe a circle, then, with one leg of compasses on circumference, draw another line from centre to circumference; those three points will give the angle of 60 degrees, or a sixth of the entire circumference, and flattened one-eighth of pitch line on top and bottom, leaving three-quarters. Whitworth's is a sixth, leaving two-thirds of pitch line. In this way we get nearly all the advantages of Whitworth's thread without some of its disadvantages. The system of standard guages of the National Machinery Company of this city are made with an accuracy equal to Whitworth's by the Pratt & Whitney Co., of Hartford, the finish and workmanship for which Whitworth is noted is equaled by this firm, who have invested a large capital in special machinery and appliances to produce these, with that method and system for which our country is already noted.

The necessity for a general uniform standard is so generally conceded, that there is no excuse for any mechanic injuring the public with bastard threads. It is for every one's interest to adopt it. The sharp worthless angles which weaken the bolt, without serving any good purpose, and allowing any slight contact to bruise and flatten the threads, causing also the taps and dies to wear out quicker, are certainly only worthy of being discarded by all sensible mechanics—it will pay them ten-fold to do so. The shallow policy of being "different from our neighbors" is a great public hurt, and will ultimately recoil on the perpetrators. Bridgebuilders, railroad and all public institutions are adopting this U. S. or Franklin Institute standard, and ultimately we will have to "fall into line." Mechanics appear to be most careless about this very important matter. A tap is a tap—if it cuts easily and gives an apparent fit, no questions are asked on the exactness of its fit on the whole bearing surface, or if the angles are right. Take and use the same test as you do in other fits, and blacken either the male or female thread, and see what contact you get. Demonstrate this with the different makes of taps and you will find it is no sinecure to have to make a good tap, with perfect angles, giving a full area of contact—very few screws cut in the lathe will show a full contact, the difficulty in having the tool a true angle, or held in exact position, are features which ordinary mechanics do not realize. The slightest spring in the tempering of a tap will, of course, make it faulty. The functions of screw threads are so important that we venture to predict mechanics will before long give this subject more careful attention.

As to constructing the bolt cutter dies we have given this subject considerable attention, as we found many theories in the field, and some of those by eminent authorities. Two questions had first to be settled: "How many cutters shall we use?" "What is the proper position of same?" The first of these was easily determined. Very little bar iron is rolled quite round; on cutting with three dies or cutters we found the tendency of the bolt was to recede into the space opposite the cutter, making it more oval and irregular. You notice this still more when cutting slowly; cutting below ¾ rapidly it is not quite so noticeable, especially if you leave your dies with considerable bearing face; but this leads to friction, which it is desirable to avoid. In rapid cutting of carriage and other small bolts, the dies, in addition to clearance, have sometimes less than ⅛ inch of face, and are run at a speed of from 250 to 400 revolutions per minute. The friction has to be brought down to the minimum, in order to stand this high rate, and you will always find four dies or their equivalent, (but very much inferior) two half dies used. We consider no three die head therefore is mechanically correct to cut a round bolt. We would hardly have thought it neccssary to dwell on this point, but we understand some mechanics have compared a tap and die as being similar, forgetting that the tap has all the time an equal external resistance, and cannot shirk, which is not the case with the bolt.

But the most difficult problem to solve is "What position should we place the cutter in?" and we know that exception may be taken to our conclusions in this matter, but as we have arrived at them only after long and careful consideration, we propose to give them. The bolt cutter is the successor of and the substitute of the lathe in its peculiar functions, therefore the principle of holding a cutting tool in the lathe seems rational and should follow on it. If you wish to cut a smooth thread in the lathe, you lead the cutter. Now, in addition, there will always be a slight yield or play of a cutter in an opening, moveable die head, and if the the cutter face is placed on a line with the centre, you will find in practice you are really below it. Several good authorities and makers place the die on a line with the centre; but, unless for very rapid cutting, and where the die is held solid in arm, we favor the exact centre simply on account of the lessened friction, butthe thread will not be so smooth. All opening, moveable die heads, therefore, should lead the centre, about half the diametrer of the cutter, say from ⅛ inch in a small head to 5-16 inch in a large one, cutting 6-inch pipe or 4-inch bolts. Cutting or hobbing the dies, when they are on a centre line, is done with taps larger in diameter than the size called for in order to get the necessary relief; but when they lead the centre, a shade smaller tap is necessary for the same purpose. A 1-inch die we cut with a master tap 1-32 smaller, then file off the back of the thread on the front segment of the circle. The "National" bolt heads of the National Machinery Company, Cleveland, allow of the dies being contracted this 1-32 inch while cutting them, and then adjusted back into position for the bolt afterwards. They are very easily and quickly re-cut.

ART IN HARDWARE.

The time is not remote when our hardware manufacturers were restricted to the plainest styles, and these styles themselves partook of a certain Eastern uniformity. Notwithstanding the malleable character of iron, and that in the mold it will yield to any form, the true artistic qualities, which without detracting from usefulness render articles more sightly, was wanting. A new and important impulse, however, has been imparted of late years to the decorative business in this line, including better forms of tools, and more convenient construction of such articles as door locks, handles, bolts, pulleys, shears, whilst in artistic fittings, such as bronze, nickel, gold and enamel for door and window decoration the productions of the present day, relatively to cost and attractive appearance, are excellent. Investors in house building have discovered that decorative hardware art pays well in increasing obtainable rental. All possessed of any taste must have remarked the sharpness and beauty of line and detail, with smoothness and almost polished finish of surface in iron, bronze and other metallic sand castings embraced in builders' hardware. Some are nickeled, some richly gilt and some enameled, the articles being finger and key plates and knobs. Some of the enameled and gilt goods are exceptional and of high cost, as in handles and plates suited only to the finest and most elaborately finished doors of hard wood, but these show how far art with us has advanced in designs of a purely decorative character. In door butts, knobs, escutcheons and finger plates for doors, in plain uncolored bronze or nickeled and gilded, the fine details of engraved design are brought out satisfactorily. So with various household hardware articles, such as stoves, art has made rapid headway. Whilst as to these economy of fuel has been provided for and difficulties of management reduced, inviting forms have been adopted and grotesque decorations have been succeeded by tasteful appendages. Art shows itself, too, in hardware construction. We may instance reversible latches, so made that they may be adapted to either right or left hand doors by simply pulling out and turning the latch or bolt before or after the lock is fixed in its place upon the door. Then we have anti-friction latches which besides ease of action require no slamming in closing. In an improved door knob an attachment is provided with wings or lugs which fit into grooves made in the knob, and effectually prevent it from turning on the shank. The rear end of the shank is provided with an internal thread to receive the threaded stem of the button, which is screwed up against the knob by

inserting a screw-driver through the opening in the shank, and cannot be operated from the outside, thus making a perfectly secure and ornamental device. With tasteful construction in hardware mechanism, it is also more strong and durable. We would instance locks of various descriptions, free from all shock and jar, almost incapable of being deranged, and with effective arrangements for reducing friction to a minimum and possessing a smooth, uniform and easy action. Steel keys even deserve mention in the way of art, for improvements in bow, stem and bit, now made in one piece from spring steel. They are nickeled to prevent rusting, and possess light, convenient and graceful forms. A volume might be written on the modern art displayed in carpenters' and cabinet makers' tools, for even chisels, gouges, screw-drivers, braces, wrenches and general tools are turned out with artistic forms. In fact the better the parts are proportioned to the strains, the more graceful the tools. Ordinary goods of cast iron have also the merit of artistic treatment; a certain grace of form is demanded, as well as the more important quality of the greatest amount of lightness relatively to strength. The economy in manufacture which has been achieved in artistic hardware of the higher class, is a matter of wonderment to the uninitiated, but on this account they are more diffused, and even in the unpromising field of hardware, its manufacturers must be credited with advancing the public taste.

AMERICAN TOOLS AND MACHINES IN FOREIGN MARKETS.

The progress of American manufactures abroad is a matter for congratulation. There is an adaptability to foreign requirements about the American makes of tools and implements which our competitors, especially the English, are slow to learn. In addition to this such goods as are made for our own market, and yet suitable to foreign climes, are if dearer yet better than others. There is a good deal in our styles which attract the attention and meet the approval of foreign customers. The British *Trade Journal*, which is not to be suspected of American proclivities, boldly comes out and says: "One of the most important branches of trade in the colonies is agricultural implements, which need constant improvements and adaptations. The English maker will not adopt any new idea except under compulsion, while American makers are eager to help out their customers with suggestions of their own. The consequence is, as a New Zealand man told me, year by year the English account grows smaller, and year by year the American account grows larger. What is true of agricultural implements is true of everything else; and it is not only the Americans, but the pushing, clever and well-instructed people in Germany, Belgium and France are invading the provinces of the English manufacturer. All this while there are fatuous outcrys against protective tariffs. Foreign protection is entirely favorable to English enterprise, if English manufacturers will but try to realize that the world is not standing still because they choose to bury their heads in the sand." There are vast markets for us to secure, and we have every confidence that a few years more will witness a vast development of American trade in European and eastern countries in manufactured articles.

THE GOVERNMENT LABOR INQUIRY.

The forthcoming labor inquiry by the Congressional Committee on Education and Labor is likely to have good results, as the report will be read throughout the States as an impartial estimate of the relations held by the working classes to employers in the matter of remuneration, and the general adjustment of mutual relations. The influences operating to affect labor and capital are perpetually changing, with an ever-altered ratio of demand on the part of consumers and variations in price of raw material, elements which have to be taken into due account in determining rates of compensation. Each interest or class in the great hives of industry will be afforded the opportunity of forwarding representations to the Committee. What we hope for, without which it will be ineffective for its purpose, is that the report will be a well-digested one, and not so bulky as to preclude its general circulation and perusal. One branch of the inquiry will concern the condition of the working classes of foreign countries, but the comparison will do little good. It is well known that, measured by money, foreign artisans do not get equal returns to our own; it is also demonstrable that wages paid to workers abroad have but a fractional effect on the prime cost of articles. The condition of countless thousands of foreign laborers is wretched, but our large cities have also their overworked and ill-remunerated employes. The labor report will well supplement that of the Tariff Commission. There is nothing better than seeking after light. The mastery of the conditions under which products are turned out in different countries will provide the basis of enlightened statesmanship, and in respect to our labor unions will teach their executive to proceed more understandingly than of late, their blind tactics having lost millions of dollars to the sons of toil.

THE Commission appointed by the General Council of Ponts et Chaussees, Paris, has lately been engaged in studying the respective merits and qualities of the different sorts of rails adopted by the French railway companies. From numerous experiments made in connection with this subject, M. Gruner, the well-known metallurgist, draws the following conclusions: First, that mild steel rails wear less and consequently last longer than the hard steel rails generally used in France; second, that this more rapid wear of the hard steel is due chiefly to the greater liability to oxidation displayed by iron and steel when allied with manganese, silicon or phosphorus; third, double flanged rails may, without inconvenience, be made of harder steel than single-flanged rails; fourth, that railway companies should agree among themselves to adopt a certain number of patterns in common, and that, if they still have any doubts as to the truth of the above conclusions, they should appoint a committee of engineers and chemists to study carefully the various causes that influence the duration of rails, inviting for this purpose the co-operation and assistance of the chief manufacturers.

OUR latest advices from England indicate an improved tone throughout the iron and steel trades of the country. There was a decline the last four weeks of several thousand tons in exports of iron to this country, but the rapid decline of freights leads to the anticipation of heavier shipments. Scotch makers' iron is unchanged. The hematite market is again firmer. There were more enquiries on the market for finished iron, and the export merchants seem to have considerable orders in hand. The bar trade throughout the country is steady, but the productive power is so great that only a large influx of orders would keep all the works well employed. The sheet mills in all parts of the country are running full time, and are well sold forward. There are more orders and enquiries for hoops, and quotations are in many instances advanced. The tin plate trade is rather dull, and prices have not that firmness which had been hoped for.

IF the crops prove satisfactory there will be a much heavier business of all legitimate kinds than there was last year, and especially for actual movement of crops and handling of products, the demand for money is likely to increase. The increase of our exports from New York, though less in amount than the corresponding period of last year, with some reduction in imports, which in July were $2,200,000 less than in July 1881, is sufficient to indicate a balance in favor of this country unless there has been a contrary change at other ports. We may add to this that the latest crop news from Europe favors the prospect of large exports of grain from this country. From all we can gather the coming crops will be abundant. Farmers, like a great many other people, are more disposed to talk of their bad than their good fortune. The cold weather early in the season made the crops generally a little later than usual, but once started they had plenty of rain, and after a while the warm weather necessary to mature them well.

WE would advise our Cleveland manufacturers to have an eye on the South; in other words, to seek to cultivate southern business connections. Orders are going East for machinery which, with a little business energy and enterprise could be secured for Cleveland. It is true that northern capitalists are largely embarking in mills, machine shops, etc., in southern States, and this circumstance is apt to secure large orders for machinists in their respective localities, but as it is the interest of all parties concerned in industrial undertakings to secure the best possible machinery, manufacturers here who concern themselves with specialties should push their claims. We know a number of works already in this city busy on southern orders. The Cuyahoga Works, for instance, have been supplying some of their largest hammers to a Louisville concern. The South is comparatively a new field for manufacturing enterprise and should be cultivated.

THERE is nothing new in the wheat market at Chicago. The stock of wheat of all grades in Chicago is now only 500,000 bushels, and it is difficult to see how lower prices can be had. The famine prices for corn still prevail, and if the shorts do not overdo the thing by selling what they have not got, lower prices must soon rule.

MANUFACTURES.

TO MACHINISTS, MANUFACTURERS AND OTHERS.

THE publishers of THE TRADE REVIEW solicit items of information concerning manufacturing and other establishments in any part of the country, and all such items will be promptly inserted in these columns, free of charge. Facts are the only things needed; and all communications should be accompanied with the name of the contributor—not for publication—but as a guarantee of good faith.

Manufacturers, machinist and engineers are particularly requested to communicate any matters of interest relating to their specialties. No one need be deterred from sending any interesting facts in his own anguage, as all such contributions will be properly revised before sending to press.

OHIO INDUSTRIES.

THE Cuyahoga Works, of Cleveland, are now erecting one of their largest size vertical blowing engines at the furnace of the Franklin Iron Works, near Utica, N. Y. This engine has a steam cylinder 40 inches bore, and an air cylinder 84 inches bore, both having a stroke of 54 inches. The main shaft is of hammered iron, 14 inches diameter and has on it two fly-wheels 16 feet diameter, each weighing about 16 tons. There will be a surface condenser attached to the engine for the purpose of producing a vacuum and furnishing the boiler with distilled water. The Cuyahoga Works have just completed three similar engines for the large new stack of the Cleveland Rolling Mill Co., at their Cleveland works, and they have under way two more for a blast furnace now building in Alabama.

F. & L. Kahn & Bros., Ironton, have given out the contract for the new addition to the stove foundry. The building is to be 162 by 46 feet, and will give room for about 40 more workmen, all

told, or over 150 men in the entire institution. This contract has been awarded to a Cincinnati man, and the building will be completed and occupied by the 1st of September. It is impossible for this firm to handle their new patterns and their growing business in the space they now occupy.

An important secret meeting of the manufacturers and workmen of all the Youngstown mills, embracing the 6th district, has been held at Youngstown. The mill owners proposed to resnme at once at last years wages, and pay ultimately the figures that would be decided on at the end of the strike. The iron workers rejected this and made a proposition to go to work at $6 per ton and abide by the result of the strike. This proprosition was not entertained. The firm of Brown, Bonnel & Co., whose pay roll amounts to $100,000 per month, have posted notices warning their men to resume work at once, or consider themselves discharged, their places to be filled by non-union men,

We have already announced that the Globe Iron Works, Cleveland, are increasing their capacity by erecting a three story brick building 120x101. We have to add that one end of the new building will bearranged for an erecting room with tram-railway on the roof, and containing three stalls with room for two of their marine engines in each. They employ about 300 men in the machine shop and 70 in the boiler shop. The steam rivet machine will strike a 40-ton blow with fifty pounds of steam.

The annual report of the Builder's Exchange of Cincinnati, shows that building material was manufactured in that city during the past year to the value of $12,000,000. This is an increase of about 15 per cent. over the product of last year. Of material which is used more or less in building, but is not usually classed with the building industries, about $3,000,000 worth was manufactured.

The American Iridium Co., Cincinnati, have a patent process of melting iridium and are introducing it for a variety of useful purposes where hard, non-corrosive metal is desirable. Being harder than steel, agate, or rock-crystal and not soluble in the strongest acids or alkalies, it forms superior points for machine tools, bearings for balances, and jewels for watches. It alloys with gold, silver or copper.—*Boston Jour. of Commerce.*

E. T. Bradford & Co., Cincinnati, have united their leather belting and hose business with the American Oak Leather Co., and the business will be conducted by that company, with office at 124 West Second street. The company have the largest oak leather tannery in the world, having a capacity of five hundred whole hides a day, and have special facilities for tanning, stretching, and finishing oak leather foi belting purposes.

John F. Seiberling and Monroe, the former owner of the Empire Mower works, and both connected with the Akron Strawboard Works, are about to erect two mammoth mills, one an oatmeal mill with a capacity of from 100 to 400 barrels a day, the other a flour mill. The oat meal mill will cost $60,000 and will be driven by an engine of 200 horse power. The flour mill will cost $90,000 and be driven by an engine of 300 horse power,

The Akron Iron Co., have put in a new engine and an additional train of rollers to work upon their hot-polished shafting, and expect to increase their output of this branch of their product fully 100 per cent.

The Shawnee Agricultural Co., at Cincinnati, has made an assignment for the benefit of its creditors. The liabilities are supposed to be not less than $25,000. The assets are somewhat less.

The shutting down of the Mahoning Iron Works, Youngstown, which are among the largest in the coutry, with the closing of the iron mills, stops the payment of nearly $3,000 a day in wages.

The Vulcan Iron Works, Toledo, are employing eighty men on full time. They melt up five tons of pig iron a day, and are busily engaged in constructing railroad excavators, and have recently added about $10,000 worth of new and improved machinery.

The Barney & Smith Manufactnring Co., Dayton, are actively engaged in the manufacture of passenger and freight cars' from three to four months' orders from old contracts having yet to be filled. They have just recieved a new steam-hammer and are employing 1200 men.

Ashtabula will next year have established there the works of the American Nail Machine Co., of Pittsburgh, manufacturers of Coyne's improved machine. They report that they have orders enough to keep them busy for over a year.

Messrs. Bowler & Co., Cleveland, have doubled their capacity for making car wheels. They have erected a new shop, 50x80 feet, for putting wheels on axles.

The Ætna Iron Co., at Bridgeport, have completed 10 new boiling furnaces. They have added an 8-inch guide mill and two sheet mills, one 24-inch, one 20-inch, and we understand are in full running order.

The Toledo Foundry & Machine Works employ 40 men, and are running their works full time. They are manufactnring circular saws, steam engines, architectual iron-work and general machinery.

The Cuyahoga Forge & Iron Co,, at Cuyahoga Falls, are running four furnaces and three trip-hammers in their forge department, in connection with one large heating furnace in their rolling mill.

Messrs. Tod & Co., Youngstown, are employing eighty men in the foundry and machine shop. Work is progressing on their new addition to be used for erecting heavy machinery.

In the rolling mills of Pittsburg there is invested a cash capital of $19,020,000 with a product amounting to $30,242,257. Previous to the strike there were 18,905 hands employed in these mills.

The Queen City Bridge and Steam-forging Co., Cincinnati, have moved into new quarters in the rear of 177 to 181 East Pearl street, and have just added a new 1300 pound steam hammer. They have every facility for bridge work and and light and heavy forging.

The Akron Miller Works are to be enlarged. The west end of these will recieve an addition 52x76 feet; the north end one of two stories high; the main building a 70 foot addition of two stories.

The pottery firm of Jones, Waite & Co., Akron who recently completed a fine down draft kiln in connection with the works, have put in an engine and clay mill with all the necessary machinery.

The Hoe and Tool Works, Ironton, have their new hammers and other machinery in full operation and are now manufacturing picks and mattocks, and filling their first orders.

The ground has been excavated for the new hot-blast stoves, at Belfont Furnace, Ironton. It is thought that after these stoves are completed, the furnace will easily make 100 tons of metal daily.

The Witman Stove Co., Ironton, have broken ground for their addition to the foundry, and it will be pushed rapidly to completion in order to meet the demands of the fall trade.

At Toledo $20,000 has been subscribed to induce the Licking Rolling Mill Co., to establish their plant in that city.

There have been but few transactions in pig iron in the Mahoning Valley, there being but few inquiries for it.

The works of Cole Bros., W. Va., are about to be transferred to Akron. They will start with 30 hands.

The Iron & Steel Co., Youngstown, has brought a crew from Pittsburgh to work one turn at sheet rolls.

It has been decided to erect a new nail mill at La Grange, and at once. The stock is $300,000.

The Howard furnace, Mahoning Valley, will make a specialty of hot blast foundry iron.

A number of blast furnaces are making contracts to be supplied with stock this fall.

Hooven & Co., Akron have made additions to their oatmeal mill,

Grant Furnace, Mahoning Valley, has blown in.

INDUSTRIES IN GENERAL.

MAINE.

Livermore Falls, a few miles above Lewiston, on the Androscoggin, is one of the most flourishing villages in Maine. It grows every year, and there are influences at work which promise to give it a wonderful start in the near future. Messrs. Chisholm and Brown, pulp manufacturers, who recently purchased the power above the falls, have completed the purchase of a large lot of land opposite, for about $2,000. They propose to build at an early day a large paper mill in connection with their pulp mill.

MASSACHUSETTS.

Boston machine shops, it is said, have notified southern transportation lines that they are now engaged in manufacturing 300 carloads of machinery for southern mills, all of which is to be delivered in the early fall. The Boston manufacturers are doing only their proportion of this work; the establishments in other cities East and throughout the Northwest are all engaged more or less of their time on orders for the southern markets.

The Brayton Petroleum Engine Company, Boston, have just completed and will shortly put on the market their horizontal petroleum engine. This engine has attention among engineers, and in its present improved form (the first being an upright engine) is thought to be a great step taken in inventive science. The fuel used is crude petroleum or the vapor of any of the hydro-carbons, combined with atmospheric air, under high pressure, in proportions of one part of vapor or gas to twelve parts air. The air is compressed by the engine itself to any required density. This compound is admitted into the cylinder, where it is burned in continuous combustion, producing, by expansion, extraordinary power.

The Boston shops are supplying, for the most part, cotton machinery for the new factories in the South, while manufacturers in the cities of Erie, Buffalo, Rochester, Cleveland, Columbus, Cincinnati, Detroit, Milwaukee, Chicago, Indianapolis, Louisville and other centres are filling orders for machinery of every description for working up the fine timber of the South.

At Orange, the new foundry of the Rodney Hunt Machine Mfg. Company has just been finished, and the heavy crane, weighing 4½ tons was put in position in thirty minutes after it was in the molding room. Work was commenced Monday last in the molding room by a full number.

The scythe-snath factory at Benardstown will manufacture cutlery, after a new dam has been built and other improvements have been made.

Ambrose Webster, superintendent of the American Watch Pool Co., Waltham, is placing on the market eight different sizes and four different styles of adjustable parallel strips. These strips are intended for planer work. Each is made of two wedged shaped pieces, one having a groove and the other a tongue arranged to slide on each other. All parts of the slips interchange. They are made of steel or cast iron as desired.

NEW HAMPSHIRE.

William Corey, manufacturer of latch needles, Manchester, has probably one of the most complete as well as the largest factories used for that business in this country. His shop consists of main brick building 60x60, three stories high, filled with the most improved machinery for his business that can be found. Mr. Corey sends his goods all over this country and Canada, and has a large number of orders on hand.

S. C. Forsaith & Co., builders of new and dealers in second hand machinery, Manchester, are doing an enormous business in both lines. This concern do the largest business in second hand machinery of almost any concern in the country, their list comprising nearly all kinds of machinery and their shipments going to every State in the Union, besides a large amount which is sent abroad.—*Boston Journal of Commerce.*

RHODE ISLAND.

The Nicholson Tile Co. employs 375 hands. The company has been in operation since 1864.

CONNECTICUT.

The Bristol Brass and Clock Company, Forestville, have their new factory all completed, the main building being 160x40, 4 stories, with one adjoining 89x35, 4 stories, with wing 40x50, 2 stories, which is being filled with new machinery. A 100 horse power Harris-Corliss engine furnishes the power. This concern are employing about 300 hands.

The Osborn & Cheesman Company, Ansonia, have their new brass mill nearly ready, which is 225x108, 3 stories, and casting shop 60x40, 3 stories. They have rececntly purchased a tract of land near their new mill, upon which they will

build a packing room 100x40, 2 stories. Machinery is furnished by the Farrel Foundry and Machine Company, of Ansonia.

THE Derby Bit Company, Ansonia, are located in their new building, 128x25, 2 stories, which is filled with new machinery. Their power is furnished by a 25 horse power engine and a National turbine wheel. They are also largely engaged in filling orders for the Derby expansive bit. These bits are manufactured from steel made especially to their order, and are not to be excelled in quality or finish.

THE Hartford Iron Works are running with a full force of hands, and using all the facilities of the late Woodruff Iron Works, with some additions made.

R. COOKE & SON, Winstead, are busily engaged in manufacturing Cooks's patent sand axle.

THE Electrical Supply Company, Ansonia, have just moved into their new brick mill, which is 100 x60, 4 stories, and filled with new machinery. They are now employing about 50 hands, and have largely increased their capacity.

NEW YORK.

THE Troy Ice Company, Troy, has been incorporated with a capital of $5,000.

NEW JERSEY.

THE factory of the Edison Light Company has been removed from Menlo Park to Newark, in order to secure larger buildings, and to be nearer the source of supply for obtaining reliable help. One hundred and fifty men are now employed, and the factory has a capacity of 1,200 lamps a day, which can be increased to 40,000 a day by employing 3,000 or 4,000 hands, for which number the factory has an ultimate capacity.

PENNSYLVANIA.

THE Pittsburg Steel Casting Company, Pittsburg is just completing a large blowing mill, the main building covering 120x180 feet. It is intended to utilize in it the large product of the Bessemer plant of the company. The growth of these works is a marvel in the steel industries of the country.

THE Glenwood Steel Works, Pittsburg, was purchased by Leishman, Gordon & Snyder, on the 30th of June, who are now having their works repaired for the purpose of commencing operations, which they expect to be able to do in two or three weeks. They will manufacture open-hearth steel blooms, slabs and ingots.

MCILVAIN'S rolling mill, Reading, has resumed operations.

THE furnaces of the Phœnix Iron Co. have gone into blast again. Another train of rolls has been started in the new mill, making four trains now in operation in that department of these immense works.

A NEW machine shop, called the "Fulton Light Machine Works," has just been started in Reading for the purpose of building small engines and all kinds of light machinery.

MICHIGAN.

THE Lake Superior Native Copper Works at Houghton, are erecting a new rolling mill of double the capacity of the present one, and it will be supplied with all modern appliances for the rapid and economical transformation of the native metal into the manufactured article. The new smelting building has recently been completed and will be supplied with two furnaces, one of which is almost ready to commence operations. The erection of a cupola large enough to run the slag from three furnaces will be carried out in a short time.

THE large shops of the Big Rapids Wagon Company, with a capital of $50,000, have been completed.

INDIANA.

THE Indianapolis Car Works, Indianapolis, have commenced on a contract to build 1,000 cars for the New York, Chicago and St. Louis roads. The cars are 30 feet in length, with carrying capacity of 40,000 pounds.

ILLINOIS.

NYE & PALMER, Chicago, are building a number of their Nye steam vacuum pumps for excavating purposes. This pump has a capacity of 25,000 gallons a minute, 50 per cent. material, removing stones upwards of seven inches diameter. They have just completed one to make excavations for the waterworks at Joliet.

THE Lambert & Bishop Wire Fence Co., of Joliet, has been incorporated under the general law, with a capital of $30,000.

THE Chicago Die and Machine Works have just shipped to the New York Central Railroad one car-wheel grinding machine, capable of grinding ten pairs of wheels per day.

CORRESPONDENCE.

FROM OUR SPECIAL TRAVELING CORRESPONDENTS.

WORCESTER, Mass., August 24.

Mr. David W. Pond, manufacturer of iron working machinery, established his business here in 1847, and has 400 hands in his employ. His business, which is extensive, is most prosperous, indicating the satisfaction of customers with his goods. These include lathes, planers, drills, boring mills, lathe and planer chucks, planer centers, gear and bolt cutters and milling machines. Mr. Pond is sole manufacturer of Taft's Patent trolling lever hand punches and shears.——The well-known firm of P. Blaisdell & Co., manufacturers of machinists' tools, including Blaisdell's patent upright drills, was established in 1865, and employs 100 hands. They find markets abroad as well as a good consumption at home for their productions. The members of the firm are S. P. Blaisdell, J. P. Jones, S. E. Hildreth, and E. Earl.——The Cleveland Machine Works, manufacturers of wood machinery, 54 Jackson-st., have conducted their extensive business since 1854. Their shipments include Canada, Mexico and Europe. They employ 150 hands.—— Prentice Bros., 54 Hermon-st., manufacturers of machinists' tools, foot-power lathes, upright drills, etc.; have 52 hands busy at their works, which were set up four years since. They have a good home and export trade, and prospects are encouraging.——F. E. Reed, successor to A. Prentice & Co., manufacturer of engine lathes, improved upright drills, hand lathes, foot power lathes, slide rests and planer cutters, No. 54 Hermon st., employs 55 hands. He was established in 1865 and ships his goods all over the Union. He has orders enough on hand to keep him running about four months. A fair proportion of these orders are from abroad.——The Worcester Machine Screw Co., manufacturers of Standard machine screws, have 80 employes. They have carried on their business thirteen years. Shipments are made to New York City as well as to a number of States, and also to Canada. Trade is fair, but not equal to last season.——The business of L. Coes & Co., manufacturers of L. Coes' patent screw wrenches, was established in 1839, the firm then being L. & A. G. Coes. The present members are L. Coes and M. O. Whittier. The firm employs 65 hands and has a flourishing home and export trade. They are running their works ten and a half hours per day; when the weather becomes cooler working time will be extended.——A. M. Powell & Co., successors to Wight & Powell, manufacturers of iron working machinery, and who commenced business in 1880, have all along had their hands full. The firm employs 40 skilled workmen.——Mr. William H. Eddy, manufacturer of machinists' tools, 81 Exchange-st., employs fifteen hands. He has been in the busiuess here nine years and receives orders far and near. Business is not quite so good this season as last.——A large business is being done in the manufacture of looms by L. J. Knowles & Bros., 57 Jackson street. There is nothing in this line to which they are not equal. A good business is being done in Knowle's patent combined hand and power screw press. There are 300 hands employed at this establishment which was founded twenty years since. The shop is 500 feet long and 3 stories high. Trade is good and the firm have all they can do. They ship all over the Union and Canada, and in addition have a large European trade—— F. E. Reed, manufacturer of improved upright drills and lathes, slide rests and planer centers has a steady demand for his goods.——Boynton & Plummer, machinists, and manufacturers of drilling machines, bolt cutters, shaping machines, etc., have been engaged in the business three years. Their home and export trade is excellent.——Geo. L. Fairbanks (successor to A. F. Henshaw,) machinist, 89 Exchange street, employs 8 hands. He has been in business here 35 years, and reports trade good.——Witherby, Rugg & Richardson, 26 Salisbury street, manufacturers of Woodworth and Daniels planers, and wood-working machinery, employs 60 hands. In addition to a good home they have a fair export trade. Their business dates from 1862. The members of the firm are L. B. Witherby, G. J. Rugg, and S. M. Richardson.—— Blake Brothers, 164 Union and 91 Exchange streets, manufacturers of machinery, of all kinds to order, especially mill machinery; employ on an average fifteen hands. Their business dates from 1856. Their trade is local.——The Union Water Meter Company, 31 and 33 Hermon street, have fifty hands constantly employed in their works, which were founded in 1868. Shipments are made all over the Union. Trade is good and prospects flattering. Mr. P. Ball is president, and Mr. J. C. Otis, treasurer.

HARTFORD, Ct., August 21.

It is gratifying to notice the progress—a progress in which a national pride may be felt, of the Pratt & Whitney Co., the superior character of whose machinery has rapidly placed them in the very first rank. They supply the best modern attachments for machinists, chain makers, and sewing nachine makers. Their business includes the manufacture of forging machinery, and hand and power machinery for threading bolts and tapping nuts. The firm employs 675 hands, and from the additional enlargements to their structure taking place from time to time and increase of their facilities, with the steady augmentation of orders, the prospect is that in a few years they will achieve in their line an unprecedented scale of operations. ——Mr. A. E. Cushman has issued his new illustrated catalogue and price list of chucks and tools manufactured by him, which will well repay examination. He has constantly made it a study to use the best materials adapted to the different parts of the chuck. In looking over his stock, my attention was particularly drawn to the independent 4-jaw, the 2-jaw 4½ inch, made with independent jaws and universal jaws; also the bench centering chuck. The combination chuck, made under his patents by the Pratt & Whitney Co., is the most complete and best made chuck in the world, and has features that no other chuck can have. Mr. Cushman's chucks are kept in stock by all dealers in such tools, and he also usually has from ten to fifteen thousand dollars worth in stock, so that all orders can be filled promptly. He also manufactures several kinds of special chucks for cutting-off lathes, screw machines, bolt machines, etc. Mr. Cushman employs 50 hands. He established his works twenty years since.——The Wm. Rogers Mfg. Co., manufacturers of electro silver plated ware, are doing a fine business. Their excellent workmanship commends them to the home and Canadian trade. They employ 125 hands.—Mr. Dwight Slate designer and manufacturer of machinery, Wood's building, 262 Main street, has been in the business more than a quarter of a century. Orders are coming in with a rapidity that keeps his 25 hands steadily at work. Orders for his sensitive drills for light cutting, his combination drivers, reamers and threading tools have been received from abroad. He makes machines for marking tools with roller dies on flat surfaces, or with flat dies on work of cylindrical form.——The Hartford Engineering Co.. employ 200 workmen. The company were established January 1st, 1881 Shipments which are active are confined to the eastern states.—The Hartford Machine Screw Co. runs 400 automatic machines for the manufacture of screws, sizes ranging from a watch to a locomotive screw. The company has been established four years. They have a branch at Elyria, O. They have run full from the day they started.——One of the most skillful watchmakers of this city is Mr. Charles Teske, 214 Asylum-st., who is devoted to his art, and may be said to have reached the highest excellence in design of construction. Mr. Teske is well known as the inventor of the mathematical watch regulator, a triumph of scientific skill.

PROVIDENCE, R. I., August 23.

While Rhode Island is a manufacturing State, Providence is its mechanical center, and is a city well known on account of the great variety and excellent quality of the machinery produced. Foremost among the many establishments justly celebrated on account of the perfection of their manufacture, is the Brown & Sharp Manufacturing Co., whose progress illustrates the fact that a permanent and successful business must be the growth of years. Established in 1833 by David Brown and his son Joseph R. Brown, the business has passed through the various transitions of David Brown & Son, Joseph R. Brown, J. R. Brown

& Sharpe, and finally has assumed the present style of Brown & Sharpe Manufacturing Co. The known reputation of this company has a substantial basis in the fact that its constant aim has been to develop mechanical perfection by the production only of machinery of superior design and workmanship. Their new factory which they now occupy is centrally located near the railway, and is a commodious building, constructed of brick with iron beams and iron columns, and is in all respects strictly fire proof. The area of floors equals 59,375 square feet. The buildings combine all of the most approved appointments calculated to facilitate economical manufacture. This company have made over 350,000 of the Wilcox & Gibbs Sewing Machine, favorably known as the only successful single thread sewing machie, the success of which is largely due to the remarkable care and accuracy shown in the manufacture of the machine, it being regarded by experts as perhaps the best in respect of all the machines now before the public. This branch of the company's manufacture includes a variety of machine tools. They carry on, on an extensive scale, the manufacture of standard rules, guages, squares, bevels, and a great variety of steel and boxwood rules and scales and other small tools for machinists' draughtman's and and woodworker's use. Such is the perfection of the mechanism in their works, that I have been beguiled into spending many hours in its inspection.——The Diamond Emery Wheel and Machine Co. employ 60 hands. The company has an extensive trade, including an export trade. The shops cover about 1,000 square feet. The machinery built by the company is renowned for its superiority. A large stock of their machinery is kept always on hand. To keep up with the demand for their goods they propose still further to increase their facilities. ——The Corliss Steam Engine Co., employs 500 hands. The company was incorporated in 1856. Trade is reported very good. The largest portion of their extensive shipments is confined to the eastern States. Mr. George H. Corliss is treasurer. ——Mr. William Harris, whose Corliss steam engine, with its patented improvements, has become famous, has carried on business here since 1864. He is one of the solid business men of Providence. In his works I found no less than 300 hands. His success illustrates the importance of a good mechanician keeping to one speciality. He ships to all principal points in New England and southern States.

ITEMS OF INTEREST.

A process recently patented in England, consists of superheating the steam after it has left the boiler, by passiug it through pipes placed along the crown of the furnace.

AT New Orleans enterprising shipowners and citisens contemplate starting lines of steamers to build up a trade between that city and ports in Central & South America.

THE output of zinc in Europe amounted in 1881 to 203,330 tons Of these Germany produced 99,405; Belgium, 65,010; the United Kingdom, 22,000; France, 13,715; and Austria, 3,200. In Germany, Upper Silesia alone produced 65,437 tons.

THE handling of petroleum in considerable quantities is always attended by more or less danger, on account of its highly explosive properties. Mr. Schlumberger, who has devoted much time and attention to the subject, has recently proposed a method by which he considers all dangers of fire resulting from explosion of petroleum can be avoided. His plan is to place upon the separate barrels of petroleum vessels of moderate size, filled with ammonia water. Should an explosion occur, these vessels would be broken, and the escaping ammonia vapours would speedily smother the spreading flames.

THE new system of Government measurement, by which port charges are regulated, is to include only net tons of actual carrying capacity, and to exclude all account of space occupied by machinery, passages, or other obstructions to stowage. This is a just and proper system, in demanding which all our shippers and mercantile badies have concurred. It will do away with one of the silly discriminations of our laws against our own ships, and will, we trust, prove the entering wedge to their thorough and permanent reformation.

THE nilometer used for the purpose of measuring the height of the Nile is situated on the island of Roda, opposite Old Cairo. It consists of a square well or chamber, in the center of which is a graduated pillar divided into 17 cubits, each about 21 7-16 inches long. Owing to the elevation of the Nile, the relative proportion of the rise of water has been altered, and it now passes about 1⅞ cubits above the highest part of the column. The state of the stream is proclaimed in the streets of Cairo during the inundation every day by several criers, to each of whom a particular district is allotted. From 24 feet to 26 feet may be taken as the ordinary maximum of the rise at Cairo.

MECHANICAL RECEIPTS AND ITEMS.

Coloring Gold Alloys.

The method of coloring gold alloys is by means of a mixture of 115 parts of white table salt and 230 parts of nitric acid, with enough water to dissolve the salt. This is boiled down to a dry mass of salt. The salt is put in a porcelain dish and 172 parts of fuming hydrochloric acid poured over it and heated to boiling. As soon as the suffocating odor of chlorine is perceived the articles to be colored are dipped in, and the first time they are left eight minutes in the liquid. In other respects the treatment is the same as aboved described. Articles that had been polished do not require polishing again. Of course care must be taken not to inhale the dangerous gas; the operation must be conducted under a draught or out of doors.

To Gild Wood with Bronze.

First of all the size must be properly prepared; if it be 'oily' or too slow in setting or hardening, the bronze powder will be 'drowned,' that is, it will sink under the size and all its impurities will cover the surface, causing it to appear muddy or dark. Quick size is therefore best, and it may be made by mixing any good rubbing varnish with a little japan, say two spoonfuls of varnish and one spoonful of japan to a sufficient quantity of chrome yellow (dry) to form a semi-transparent paint; add a few drops of turpentine to cause it to flow freely from the pencil.

To Temper an Axe.

Take six pounds of tallow and two pounds of beeswax and one ounce of finely pulverized sal-ammoniac. Melt the tallow and beeswax together, and then put in the sal-ammoniac. Pour the mixture in a sheet-iron box, which, for convenience, should be 2 feet long, 4 inches wide and 4 inches deep. A box of these dimensions will hold enough of the mixture for tempering any sized axe, hoe or other tool. When the axe is ready for tempering, heat to a white red; then put it into the mixture deep enough to cover the steel all over. Let it remain from one to two minutes, then put in the water the same way. Then draw to a blue color and return to the mixture as before. Then hold it over the fire until it becomes dry, and then put it back into the water to cool. Never heat the steel more than to a light red when forged out.

Lacing Belts.

In punching a belt for lacing, it is desirable to use an oval punch; the larger diameter of the punch being parallel with the belt, so as to cut out as little of the effective section of the leather as possible. Begin to lace in the center of the belt, and take care to keep the ends exactly in line, and to lace both sides with equal tightness. The lacing should not be crossed on the side of belt that runs next the pulley. Thin but strong laces only should be used.

To Smooth Galvanized Wire.

In order to obtain galvanized wire with a smooth surface it is proposed to pass the wire as it leaves the zinc bath through openings produced by dovetailing two combs. These should fit the wire accurately. They do not, however, remove the zinc which adheres to the wire. This is effected by a small tube of solid zinc produced immediately in front of the openings as soon as the working commences. In order to facilitate the production of this tube, the distance of the combs from the surface of the zinc bath at the place where the wire leaves the bath, and the rapidity with which it is removed, must be determined by experience, otherwise the zinc would solidify before it reached the combs. The lower comb is a fixture, whilst the upper comb can be turned up. Thus new wires can be inserted and tubes prepared for the passage of the wire.

USEFUL RECEIPTS.

TO WRITE, GILD AND ORNAMENT ON GLASS.—Before you commence this work you must acquire a thorough knowledge of sign writing, otherwise it would be folly to attempt it. You will require a drawing on paper for each design, which you will prepare as follows: Cut a piece of thin paper to the size of your glass, draw out your design correctly in black lead pencil on the paper, then prick through the outline of the letters with a fine needle. Tie up a little dry white lead in a piece of rag; this is a pounce bag. Now place your design upon the glass right side up, and dust it with the pounce bag; take the paper casefully off, and the design will appear in white dots upon the glass; this is to guide you in laying on the gold on the opposite side. Now clean the glass well on the side that the gold is to go on; prepare your size in the following manner: Get some perfectly clean water, without the slightest particle of grease or other foreign matter; put it on a slow fire to boil, using an enameled saucepan for that purpose, and taking particular care the smoke does not get into it; while boiling, put in two or three shreds of the very best isinglass; let it boil a few minutes, then strain it through a fine, clean linen rag; when cool it is ready for use. The great point in glass gilding is to have the glass, the size, and everything you use, perfectly clean; a touch of the finger on the glass will tarnish the gold; you must use the tip and cushion to put on the gold, laying the gold on as level as possible, as its uniform brightness depends in a great measure upon that point; use a flat camel's hair tool for laving on the size; flow the size on, and let it drain off when you put the gold on; when perfectly dry, take a ball of the finest cotton wool, and gently rub or polish the gold; you can then lay on another coat of gold if desirable; it is now ready for writing. As the letters will have to be written the backward way, you must turn your drawing face side downwards, and pounce as before; but on the gold this time mix a little of the best vegetable black with black Japan; thin with turpentine to a proper working consistency; write with this when thoroughly dry; wash off the superfluous gold, and shade as in sign writing. In ornaments you will have to etch, or shade the gold, proceed to lay on the gold, and pounce the ornament exactly as above; then etch or shade it with the point of a slate pencil, or piece of hard wood, slightly wetting the wood, when you want a broad or black line; then pick in with black.

TO MAKE A LIQUID GLUE.—To make a liquid glue, dissolve 50 parts starch in water. Dissolve in another vessel, at a moderate heat, over the water bath, 50 parts gelatine, or glue, in sufficient water. When the gelatine is well dissolved, 50 parts turpentine are mixed with it, and the starch solution is then added. When the different ingredients are well mixed together, the glue is taken away from the fire and water is added to it, in order to give it the required fluidity.

TO IMITATE WALNUT OR TEAK WOOD.—Brunswick black thinned down with turpentine until it has attained the right tone or color, will, if a little varnish be added, about one-twentieth of the bulk of the black and turps, prove a stain for imitating walnut or teak wood. There is no difficulty in getting the mixture to dry hard, and it will take varnish over it first-class.

ZINC WHITEWASH.—Mix oxide of zinc with common size, and apply it with an ordinary whitewash brush to the ceilings or walls. After this apply in the same way a wash of chloride of zinc, which will combine with the oxide to form a smooth cement with a shining surface.

WATERPROOF VARNISH FOR BRASS.—To make a waterproof varnish for brass models, something that will dry quickly, try the following: Shellac, 3 ounces; alcohol, 1 pint; dissolve by digestion and agitation in a covered vessel, and dilute with alcohol if not thin enough for use. Warm the metal and apply the varnish quickly.—*Boston Jour. of Commerce.*

VARNISH FOR PRESERVING WOOD.—Dr. Hager gives the following receipt for a varnish for preserving wood: Dissolve 100 parts borax and 50 parts caustic soda in 4000 parts water. Boil in an iron vessel; then dissolve 450 parts gum lac. To this solution 200 parts phenic acid are added of 90 to 95 degrees B. When used the varnish is slightly heated and mixed with one-third of its volume of boiling water.

PRACTICAL MECHANICS.

Flanging Boiler Heads.

The study of the causes and nature of the defect known as grooving, as fractures which frequently occur in the flanges of heads or tube sheets and parts of boilers where flanging is done, leads to the conclusion that flanges, as ordinarily turned, are very much too sharp, or turned to too short a radius. The evil effect upon iron of bending it too sharply may be shown by a diagram which represents a full size section of a tube sheet at the augle of flange, bent to a radius equal to about the thickness of the plate, as frequently found in practice. Indeed the sheets are frequently found with a still shorter bend, sometimes almost a sharp corner on the inside. The effect of this is to unduly strain the iron, both on the outside and inside of the flange, the outside being under a combined tensile and bending strain generally to such an extent that a section of the flange shows a laminated appearance, caused by the layers of the plate being separated and sliding upon each other, while the outside of the plate, unless of extra fine iron worked with more skill than is usual, if examined closely, will be found to be filled with small cracks having the appearance of season checks, as seen in timber. The inside of the flange, on the contrary, is in a state of undue compression, the fibers being crushed and buckled up. The effect of too sharp flanging may easily be shown; by taking a narrow strip of boiler plate and bending it very sharply the effect will be very marked. This disturbance of the fibers and laminæ of the iron renders it peculiarly susceptible to the corrosive action of the acid present to a greater or less extent in all waters, the result being manifested by grooving or channeling and fracture along the angle of the flange, caused by the combined action of grooving and "working" caused by variations of pressure and contraction and expansion.

Making Files by Hand.

The process of making files by hand-cutting, though carried on from the time files were first used, is imperfectly understood by the great body of mechanics in its present improved state. We have recently given some special attention to the subject, and will endeavor to describe the process as carried on in what we believe to be the largest factory producing exclusively hand cut files in this country. When purchased, the steel is taken to the store-room, which contains twenty-five tons and upwards. From the store-room it is taken to the forging shop, where it is cut to the required lengths for forging. Each length is then piled away by itself. For heating, a plain covered brick forge, for hard coal, is used. The steel is heated and drawn out under a power hammer, the "tang" being formed first, after which the other end is heated and drawn to the proper taper. Special dies are fitted to the hammer and adapted to each class of work, so that only one heat is required on any file to form either end. The operation of forg ing files may appear to some to be a rough process, but this is a mistake. Forging file blanks properly is very particular work, as they must be of a uniform length, taper and thickness. The dies in coming together produce a uniform size and shape every stroke, after which a few blows with a hand hammer are sufficient to complete the operation. Flat, half round and square files are mainly forged under a power hammer, but round files, also the smaller classes, are forged by hand. The anvil or forging block differs somewhat from those used for general forging. It consists of a block of stone set firmly in the grouud. On this stone is placed an iron block, which is secured by wooden wedges in a deep recess. The plain face is for forging flat and tapered forms. The hollow swag block is for round and half round shapes, while the hardy having a gauge attached, is for cutting the forged shape to a uniform length. The block is arranged with slots, so that different swag blocks may be readily introduced. The hammers used in the file manufacture are of a peculiar shape, and usually weigh about five pounds. The reason for their peculiar shape is that in forging or cutting files a perpendicular blow is never required; but, on the contrary, an inclined blow is given, which has a tendency to draw towards the operator. The style of hammer used has been found in practice to be best adapted to the work, besides being the easiest and best to handle. For forging the "tangs" of small files a special furnace is generally used, and a hammer weighing 3½ pounds.

INDUSTRIAL SCIENCE.

The Temper of Steel.

The word temper, as used by the steel maker, indicates the amount of carbon in steel; thus, steel of high temper is steel containing much carbon; steel of low temper is steel containing little carbon; steel of medium temper is steel containing carbon between these limits, etc. As the temper of steel can only be observed in the iugot it is not necessary to the needs of the trade to attempt any description of the mode of observation, especially as this is purely a matter of education of the eye, only to be obtained by years of experience. The act of tempering steel is the act of giving to a piece of steel, after it has been shaped, the hardness necessary for the work it has to do. This is done by first hardening the piece, generally a good deal harder than is necessary, and then toughening it by slow heating and gradual softening until it is just right for the work. A piece of steel properly tempered should always be finer in grain than the bar from which it was made. If it is necessary, in order to make the piece as hard as is required, to heat it so hot that after being hardened it will be as coarse or coarser in grain than the bar, then the steel itself is of too low temper for the desired work. In a case of this kind, the steel maker should at once be notified of the fact, who should immediately correct the trouble by furnishing higher steel. If a great degree of hardness is not desired, as in the case of taps and most tools of complicated form, and it is found that at a moderate heat the tools are too hard and are liable to crack, the smith should first use a lower heat in order to save the tools already made, and then notify the steel maker that his steel was too high, so as to prevent a recurrence of the trouble. In all cases where steel is used in large quantities for the same purpose, as in the making of axes, springs, forks, etc., there is very little difficulty about temper, because, after one or two trials, the steel maker learns what his customer requires, and can always furnish it to him. In large general works, however, such as rolling mill and nail factories, or large machine works, or large railroad shops, both the maker and worker of the steel labor under disadvantages from want of a mutual understanding. The steel maker receives his order and fills the sizes of temper best adapted to general work, and the smith usually tries to harden all tools at about the same heat. The steel maker is right, because he is afraid to make the steel too high or too low for fear it will not suit, and so he gives an average adapted to the size of the bar. The smith is right, because he is generally the most hurried and crowded man about the establishment. He must forge a tap for this man, a cold nail knife for that one, and a lathe cutter for another, and so on; and each man is in a hurry. Under these circumstances he cannot be expected to test every piece of steel he uses, and find out with what heat it will harden and refine properly.

Planing Machine Cutter-Heads.

Why do cutter heads get out of balance and what is the best preventive, are two questions that trouble a great many mill men, and have been propounded to as frequently. When cylinders are turned out from any reputable shop they are bored the entire length and the shaft or spindle fitted therein. Here is the first chance to spoil a cylinder's running qualities, for on account of the hole being so long it may not be round or parallel throughout the whole length unless done by an expert machinist, and as the steel shaft must be a very tight fit, an imperfection in the hole will communicate to the shaft in driving in. This can be turned straight, round, and true, and accurately balanced, but if it ever gets well heated while running, it will spring back the same as when first fitted. Again, a cylinder if made of cast iron should not be cast just about the finished length, because, when so done, the dirt, slag and other impurities all gather at the top and cause the iron to be porous, dirty and uneven in weight, consequently a good running balance can scarcely be attained. Although this is wrong, it is also a cheap method, and is done every day. The proper way is to cast about one foot too long for the cylinder and cut off the surplus length. This gets rid of the imperfect parts and leaves only the sound iron, and with good workmanship a perfect job is an assured fact. Owing to the fast speed and heavy weight, only the best hammered tool steel should be used, which makes a difference over common machine steel of at least three times the wear in favor of the best.

A set of new knives should be carefully tested to see that they are correctly balanced and kept so. A knife out of balance a little throws the cylinder out, makes rough work and wears the bearing. This when once started, detoriates extremely fast, and getting the knives back to balance does not remedy the matter. Both the spindle and boxes are brought to that state were a machinist's services are called in, and the cylinders re-turned and balanced. Cylinder boxes should never be babbitted with the cylinder in, as it, in ninety-nine cases out of a hundred, gets sprung by the hot metal being suddenly poured on it. A plain iron arbor kept 1-100 of an inch larger than the cylinder bearings should be made and fitted for the cylinder every time the bearings are refitted. It should also be nicely straightened every time it is used, as it, also, is sprung by the babbit. Mather spindles should be treated in the same general way; too little care is used to keep matcher cutters in balance. They are so small and light that most people think that they can't be out much anyway. The fact is that they require as nice balance and adjustments as the surfacing heads and knives. Cylinder boxes should not be self-oiling, for this reason; if the self-oiling device is depended upon, it does not self-oil some fine morning, and your bearings are ruined because the oil chambers were not replenished in time or they became clogged or gummed. If they are not to be depended upon, what are the benefits derived from them? There are some places on machines where self-oilers can hardly be avoided, such as the upright or matcher spindle, as the oil poured in by hand would soon drop out. These can be made so that they will do good service by arranging a large oil chamber on the box caps and feeding the oil by capillary attraction through a hole at the top of the box. This will allow the whole box to be properly lubricated and should be looked after often enough to be sure that there is always plenty of oil in the chamber.

Cylinders on surface planers should have at least one-sixteenth end play to prevent abrasion, if they should, from any cause, get heated enough to expand, and on flooring machines, where beading and fancy siding knives are used have from one-eighth to three-sixteenths end play, and arms fitted with wooden plugs or screws to keep the cylinder from vibrating, and also to shift endways for the allowance of fine adjustment of beading and other knives should they not come exactly in place at the first setting. This saves stopping the machine and re-setting knives and will be found generally convenient. The reason we prefer to have the beading and fancy knives placed on the main top cylinder is that it dispenses with an extra cutter head and its care—can be set at at one time and place, and the beading or coves will always "track," which is not the case with an extra head. Besides, it will always keep its place and stay put, and if a board by any chance should leave the guides after the tongue and grooves are cut, the bead or cove is also cut in its proper place and no harm done, while the reverse is the case with an extra cutter head at the delivery end of the machine. The application of the facts we have stated will greatly tend to the success of both operator and mill.

Improved Locks.—The Yale Lock Company have completed, and are about to introduce, a marked improvement in their entire line of locks, which will have the effect of giving them additional security and promoting convenience in using the key. In the original form the key was flat and entered a slot with parallel sides. In the improved lock the key is corrugated in longitudinal lines, and the slot for its admision is sinuous. This improvement is effected without increasing the size or weight of the key, and as the corrugations act as guides, the key cannot be tilted or stick on account of a downward pressure or the weight of a bunch of keys pendant from the ring to which it is attached. It is impossible to insert in the lock any other keys than those made for it, thus increasing, in a marked degree, the security which has always been sought in the Yale locks, and false keys cannot be made from strips of sheet metal, as the corrugations of the true key cannot be duplicated except by machinery. This improvement is now applied to rim and mortise locks, but during the season their full line of cabinet locks will be changed in the same way.

SCIENCE AND INVENTION.

CONDUCTIVITY AND RESISTANCE OF METALS.—Taking silver as the basis of comparison, the following table shows the relative conductivity and resistance of various metals:

	Conductivity.	Resistance.
Silver	100	100
Copper	90	111
Gold	65	154
Zinc	24	417
Brass	18	556
Iron	15	667
Platinum	14	714
Tin	14	714
Lead	8	1250

ROTARY WATER MOTOR.—A recent issue of *Dingler's Polytechnisches Journal* contains a description and several illustrations of Mr. Spohn's (Stettin) Rotary Water Motor, which is apparently a very compact and durable piece of mechanism. The piston, if we may so call it, is provided with eight vanes, capable of turning about axes passing through their respective centers of gravity, while to the inside of the cylinder are cast four projections slightly touching the piston, and provided with channels through which the water-pro ducing motion is introduced. These channels are in connection with the main feed pipes passing through the two separate cylinder covers. The vanes when passing the projections mentioned are depressed, closing at the same time the exit channels in the piston through which the waste water escapes. Having passed the projections the pressure of the water causes the vanes to assume their original upright position. Accumulations of water in the machine are prevented by an orifice in the lowest part of the cylinder.

STEAM PRESS FOR MAKING AXLES.—A steam press for forming axles, has been invented by Mr. William Evans, of Chester, Pa. It is an immense piece of machinery, weighing thirteen tons, and is capable of making a hatchet, adze or broadaxe in a remarkably short space of time. The working of this apparatus is somewhat complicated. Dies are used according to the shape of the tool desired In these dies a piece of iron of the proper weight is put, and by pressure it is reduced to the desired shape. An arrangement is also provided by which the steel for the cutting edge is welded to the body by pressure from four directions. After this has been accomplished, the piece is again placed in the die, and is repressed and the eye punched. A workman then takes it, paints it and dresses it ready for the market. The machine here briefly described is expected to turn out twenty-four dozen hatchets per day. Besides its usefulness in the direction named, it is also used for cutting iron. A heavy knife is put upon the machine,and it has sufficient strength to make a clean cut through a piece of cold iron 2 1-2 inches thick by 1 1-4 inches. This machine has the promise of becoming a valuable auxiliary in connection with edge tools. Its speed is the most remarkable feature.

A SENSITIVE THERMOMETER.—Since Mr. Edison's invention of the microtasimeter which proved so sensitive to heat, satisfactory instruments for the measurement of extremely delicate changes of temperature have not been brought out. M. Michelson, of Paris, however, recently exhibited before the French Physical Society an apparatus in its experimental form which appears to satisfy all the requirements. The apparatus is based on the principle of bi-metallic thermometers, ebonite or hard rubber being chosen instead of one of the metals. Hard rubber is ten times more dilatable than platinum when exposed to heat, and a spring composed of platinum on one side and ebonite on the other will curve under the least increase of temperature. At the extremity of the spring is fixed a small glass stem forming an elbowed lever which rests against a small mirror suspended by a silk fiber. When the spring curves or straightens, as the case may be, the mirror is deflected, and a ray of light from a lamp reflected from its surface upon a scale moves up or down the divisions of the same. By giving to the spring and lever a relatively great length, the instrument can be made exceedingly sensitive, and the inventor expects to be able to measure the thousandth of a degree centigrade.

A NOVEL FIRE-BOX.—Mr. C. K. Villas, of Alstead, N. H., recently patented a reversible rotative fire-box, consisting of a spherical chamber or box provided with perforated covers. By rocking this fire-box to and fro by means of a crank ashes and clinkers may be easily removed. The apertures in the covers may be so small that very little coal can escape with the ashes, and the objectionable process of dumping is thus entirely avoided. In building a fire the box is nearly filled with coal, which is kindled at the top; the apparatus is then reversed, bringing the fire under the coal, and in the same way when the fire goes out, with the box nearly full of coal, the above operation may be repeated without special inconvenience. By whirling the box around rapidly the ashes may be completely removed and the fire extinguished when desired.

THE Joplin Union Mining Lead and Zinc Company has just been formed in Joplin, and will do a large business.

A company known as the Steel Association of Ontario has recently been organized to work valuable ore lands at Belleville, Canada, and works are to be erected at once.

DIVISION OF DRIVING POWER.—The division of driving power has become an important matter of consideration with manufacturers. Many are replacing one large engine by two or three smaller ones so that needed repairs may not close all departments at the same time. It has been suggested that electricity would before long furnish the artificial light for manufactories; so that if one engine is stopped another might drive the machines for providing the light. As an additional reason in favor of this division of power, when occasionally only certain departments require over time work a small engine may supply the need and save the expense of running the shafting for the whole of the machinery.

TIRES OF MIXED METALS.—The St. Chamond Works have recently begun to manufacture tires of mixed metal—half iron and steel—and which, it is claimed, will have the hardness of the latter without its fragility. The body of the tire is composed of a ring made of pieces of puddled steel, and inserted between two hoops of fine iron, which form the outer side of the section. The whole is welded together by the hammer. The principles of this manufacture are as follows, but they have not been developed very far as yet: A bar of fine iron which is to serve as the core, is first rolled, and then a hoop of fine iron is put on at each end cold. One of these hoops is afterwards to form the flange and is composed of three coils of equal size. The other is formed of a single coil, and is to make the outer face of the tire. Wedges of puddled steel are then placed obliquely in the space between the two hoops, thus making so many spirals inclined on the axis of the tire. This arrangement brings the wedges together when the hammer is applied, and thus a complete welding is obtained. The round pieces thus obtained are forged and welded with the hammer. Four heats are requisite to obtain a ring like those used in the ordinary processes. The welding is completed by the rolling, and it brings the inside core to such a small thickness that it disappears altogether in the boring.

SPEED OF WINDMILLS.—We are reminded by an article in a contemporary, says the American Engineer, which incidentally considers the value of the windmill as a prime mover, that it is not generally known that the best windmills constructed are regulated so, that however high the velocity and pressure of wind, the windmill never eqceeds in revolutions a fixed number per minute. As the wind increases in intensity, less surface is presented to the same, so that the number of revolutions are kept practically uniform. There are two methods by which this result is accomplished in American windmills. One known as the centrifugal governor method; the other, as the "side vane" method. In the former type of windmill, the increased speed of rotation of the wind-wheel throws out governor-balls which by means of a system of levers, rotates the windmill blades or slats upon their axes of suspension. In the latter type the slats are fixed and there is a "side vane" nearly in the plane of and directly behind the wheel, and attached to the bearing of the windmill shaft. The increased pressure of wind acting upon the side vane causes the windmill to turn away gradually from the wind. In this operation a counterbalance weight is raised, so that as the wind pressure decreases, the wheel returns to a position that presents an increased surface, thus causing the number of revolutions of the windmill to be uniform.

QUALITIES OF ALUMINIUM—Aluminium is a constituent of all clays, which are essentially hydrate silicates of alumina. In a combination with other silicates it forms a vast number of minerals. It also occurs in tne form of fluoride of aluminium and sodium in cryolite. Clay contains on an average about five per cent of metal. It is easy there-, fore, to form an estimate of the vast quantity of this element in the earth's crust. The properties of aluminium entitles it to be classed in the very foremost rank of useful metals. It is white, with a faint tinge of blue. It takes a fine polish, and is quite destitute of taste and odor. It is both malleable and ductile, and can be beaten and rolled in the same manner as gold and silver, and drawn into extremely thin wire. After being melted it is as soft as pure silver, but when hammered or rolled it acquires the hardness of pure iron, and in elasticity and tenacity it rivals silver. Its melting point is neither inconveniently high nor inconveniently low, being intermediate between the melting points of zinc and silver and approximately 700 degrees C. It can be cast well in metal moulds, and still better in moulds of sand, and it requires no flux in the melting. It is highly sonorous, a bell cast in aluminium emitting a beautiful clear sound. Heated to a high temperature it does not volatilize—in other words, there is no loss from fuming during the melting. It is said to conduct electricity eight times as well as copper and silver. It does not oxidize in the air even when red hot, and preserves its lustre in the atmosphere of large towns, where silver rapidiy tarnishes. It resists extremely well the action of acids, of which hydrochloric is the best solvent for it. It is very light, being only 2.5 specific gravity; and it follows from this that one pound of aluminium goes as far as three pounds of iron and five pounds of lead. It is scarcely possible to conceive a metal more highly endowed with useful properties. It would for many purposes replace iron, copper, zinc, lead, silver, tin, nickel, gold, and it excels iron in abundance. Unfortunately, aluminium is obtained in the metallic state only with great difficulty. At present its price ($14 per pound) precludes its use on any extensive scale.

CEMENT VS. EARTHENWARE PIPES.—The adoption of cement pipes instead of stoneware for large sections has met with the approval of many engineers. The old brick culverts and sewers are costly and tedious in construction, and the cement or concrete pipes made are in many respects worthy substitutes of them, and are made by many firms who manufacture concrete goods. There are certain advantages they possess also over large stoneware pipes which may be worth pointing out. One of these is that they do not warp or twist in the manufacture. Earthenware pipes subjected to the action of the fire are liable to warp and crack, and in large sections are not very true in the section and joints. The consequence is that the drain offers obstruction to the flow of sewage. The cement pipe joints can be made without projections or sockets, and so a more uniform bed is obtained for the pipes, and the joint itself is stronger, as the cement used in setting has an affinity for the material of the pipe itself. Thus in some of the cement pipes the joints are rebated with an ogee-joint, and the pipes are simply brought together with a little luting of neat cement, and a continuous pipe is thus formed. For wells and shafts the cement concrete pipes have been used with much success, and they have been tested under a considerable pressure, and found perfectly watertight. It has been asserted that pipes 15 inches in diameter of this material, jointed in cement, have supported over a ton weight at the lower end. Earthenware pipes are brittle, and readily fracture under pressure if not perfect, but those made of concrete are more tenacious, and are found to withstand the sudden shock of street traffic better than stoneware drains. When placed underneath the sleepers of railways, not far below the surface, they have been found to withstand the pressure caused by passing trains. Another decided advantage in favor of concrete or cement tubes is that they offer better facilities for making junctions, and holes can be cut in them to introduce shafts or ventillators. We have other evidence of a nature which shows that concrete sewers and pipes of 12-inch and 18-inch, are not only quicker laid than ordinary earthenware, but are stronger, more durable, more self-cleansing, and cheaper. The sewage matter gases harden them rather than otherwise. They are usually made from 6 inches up to 36 inches in diameter.

RAILROADS.

The question of extending the Connotton Valley road from its present terminus, Sherrodsville, O., southward to the Ohio river, is being agitated.

The railway track is now laid three miles north of Magdalena, in Sonora, Mex., and the gap between the Arizona and Sonora ends is only 70 miles, with the grading completed in Arizona.

The grading forces of the approaching lines of the Southern Pacific and the San Antonia roads are only about twenty miles apart, and will meet in the course of six weeks. The track will certainly meet by by October, giving through line from San Francisco to New Orleans.

There is trouble between the Valley road and the Cleveland & Pittsburgh at Mineral Point, O. The former has tried to cross the Cleveland, but the latter keeps an engine standing on the track constantly, manned by five men, at the point where the crossing is sought to be made.

The three companies competing for business between the Missouri river and Denver—the Union Pacific, Atchison, Topeka & Santa Fe, and Chicago, Burlington & Quincy—have not yet completed their proposed pool, the terms for which were very nearly agreed upon several weeks ago. The reported difficulty is not that of driving the traffic at present, but the fact that the Union Pacific desires to have the Chicago, Burlington & Quincy agree not to build any extension westward from Denver. This agreement the latter company is not willing to make.

The formal amalgamation of the Grand Trunk and Great Western railways has been completed, and the Great Western system of 823 miles ceases to exist in name so far as its operation is concerned, and now forms part of the great system of 3,330 miles, made up as follows: Grand Trunk proper and affiliated lines, 1,511¾ miles; Great Western and affiliated lines, 823¼ miles; Midland Railway of Canada, 471 miles; Chicago & Grand Trunk Railway, 335 miles; Detroit, Grand Haven & Milwaukee Railway, 189 miles; making a total of 3,330 miles. This formidable aggregate almost precisely corresponds with the present mileage of the Chicago & Northwestern system.

The life of railroad plant is not great. New roads with iron rails and wooden structures will need renewals for the most part within ten years. Ties will rot out in from five to eight years. Rails endure according to traffic, and, for light work will last ten years. Good wooden bridges when new will be dangerous in ten years unless covered, and if there is any intention to cover them the roofing should be completed within two years, or the timber will become affected with "dry rot." A wooden bridge nicely covered and painted may appear to be in the best of condition, but really be in the very worst. Joints in the lower chord of such bridges are seen to be pulling out by the locks splitting off.

Messrs. J. E. Redfield, George W. Kneisly and J. O. Arnold have succeeded in forming a syndicate of Boston capitalists for the construction of the Chicago & Hocking Valley Railroad. This road is to be built at once from the Hocking coalfields to Chicago. These gentlemen have secured the assurance of a number of coal mines now in operation in the Valley ,and in addition thereto not less than 83 per cent. of the Standard Coal and Iron Co.'s business upon the completion of the road.

The Vandalia Line has reduced the rates from Chicago to New York, Baltimore, Washington and Philadelphia, giving as an excuse that eastern lines, competitors of the Pennyslvania Railroad, are paying a commission to brokers for the purpose of influencing travel. The Ohio & Mississippi Railroad has followed suit.

A great improvement at Ashland is the Norton Iron Works, consisting of a furnace and nail factory, with coal and ore fields of large extent. The Norton furnace is the largest in Kentucky, and has made as high as eighty tons a day, but its average is about sixty. The nail factory can turn out 800 kegs of nails a day, the furnace furnishing the bulk of the raw material. The Norton Iron Works own 15,000 acres of coal and ore lands. From 800 to 1,000 men are employed in all branches. The pay rolls amount to $50,000 or $60,000 a month.

WEIGHT OF FLY-WHEELS.

There is evidently a want of definite knowledge among engine builders in regard to the weight of the fly-wheels necessary for a given regulation. This will not appear surprising when we reflect that the question is one rather of mathematical than mechanical ability. The average engine designer, however great his practical observation and skill, has but little taste or time for solving intricate mathemetical problems. He may have clear ideas as to the functional duty of the fly wheel, and know that its regulating power depends upon its weight and velocity. He may even have a fair knowledge of mathematics without being able to determine, with satisfaction to himself, the correct weight required under specified conditions. He knows that engines will make a certain number of revolutions in a given time with very light fly-wheels, or with enormously heavy ones, and as a man of judgment, he may not verge upon either extreme. Briefly stated, in the great majority of cases in practice, the determination of the weight of a fly-wheel is simply guess-work. In fact, it may be questioned whether, even among the more-advanced engine builders, two can be found to estimate approximately the same weight in a given case. The disagreement would not arise from a want of rules, but in the rules themselves, many of which are either plainly absurd and misleading, or contain constants, the composition of which is best known to the authors.

FOUR HUNDRED BLOWS A MINUTE.—Dr. W. T. Browne, of Stockton, Cal., has recently perfected a rotary hammer that promises to revolutionize those branches of industry in which the hammer plays an important part. It consists of a series of hammers arranged so that their faces extend beyond the periphery of a wheel and strike a sliding rod, to which is adjusted a drill, a hammer or a quartz crusher, or whatever device is needed to accomplish the desired work. When these hammers strike the drill—the machine now on exhibition is fixed to drill rock—they slide off out of the way in the most remarkable manner, without perceptibly decreasing the velocity of the wheel. They spring into position again and never miss a stroke. The machine now in operation contains eight hammers, and one man turning it can deliver 400 powerful blows a minute. Two pieces of rock show the work the machine does drilling. In freestone a man drills an inch a minute, turning the machine leisurely. A ratchet turns the drill a small fraction of an inch at each stroke, and all the driller has to do is to turn the crank. In granite rock from half an inch to an inch can be drilled in a minute. The individual hammers each weigh eleven pounds. Turning the wheel forty revolutions a minute the machine delivers 320 blows of 66 pounds each; and fifty revolutions give 400 blows of 82 pounds each, and sixty revolutions give 480 blows of 99 pounds each, aggregating over twenty a minute.

THE MIDSHIPMAID.

The sea is calm, the sky is blue;
I've nothing in the world to do
But watch the sea gulls flap and veer,
From 'neath the awning on the pier;
And as I muse there in the shade,
I see a merry midshipmaid.

The sauciest of bonny belles,
In broidered coat with gay lapels;
Her ample tresses one descries
are closely plated pig-tailwise,
A smart cocked hat, a trim cockade,
Are sported by this midshipmaid.

I wonder, in a dreamy way,
If e'er she lived in Nelson's day?
Was she a kind of "William Carr,"
Or did she fight at Trafalgar?
And could she wield a cutlass blade,
This laughing little midshipmaid?

Was she among the trusty lads—
Before the time of ironclads—
Those reckless brave young hearts of oak,
who looked on danger as a joke?
Or did she ever feel afraid,
This dainty little midshipmaid?

She might have fought, indeed she should,
In time of Howe or Collingwood;
She might have—but I pause and note
She wears a kilted petticoat;
And 'neath it you may see displayed
Trim ankles of the midshipmaid!

* * * My dream is past! This naval swell
Is naught but pretty Cousin Nell!
"You lazy thing," says she "confess
You're quite enchanted with my dress,
Just take me down the Esplanade!"
I'm captured by the midshipmaid!

—*Punch.*

REVIEWS.

The Century Illustrated Monthly Magazine for September. New York: The Century Company, Union Square.

The September issue of this charming magazine opens with a steel engraving of Mark Twain. Ocean steamships are illustrated. "The Original Rebecca in Ivanhoe" is a contribution. At a time when so much attention is directed to the East, Ningpo and the Buddhist Temples will be perused with no little interest. The absorbingly engaging story, "A Modern Instance," is continued. A variety of novelettes and articles, poems and sketches of current topics make a most enjoyable number.

Oriental Religion, (Humboldt Library). New York: J. Fitzgerald & Co., 30 Lafayette Place.

This is a most serviceable number of this semi-weekly issue of the series of Popular Science Literature, which together make up a valuable library representing the intellectual life of the nineteenth century, the physical, moral and mental phenomena of the Universe and embodying masterpieces of scientific exposition. The work is written by John Caird, president of the University of Glasgow, and other eminent authors.

Lippincott's Magazine for September. Philadelphia: J. B. Lippincott & Co.

This admirably illustrated monthly of popular literature contains in this issue its usual variety of matter, both entertaining and of a solid character. The subjects are: "An Antwerp Printing House;" "Fairy Gold," a story; "At War;" "Through Great Britain on a Drag;" "Animal Electricians;" Guy's Legacy," a story; "The Milky Way;" "Invading the Temple of Heaven;" "Round About the Peaks of Otter;" "Interchange;" Songs That Have Made History;" "Mrs. Witherell's Mistake," a story. These contributions are followed by most lively editorial gossip on leading topics of the day and a review of literature.

Wide Awake, for September. Boston: Houghton, Mifflin & Co.

The frontispiece is a beautiful drawing illustrating a charming Norse story, "The Castle of the Winds." The number contains choice stories and articles suited to the young, with a large number of engravings; also attractive poems exquisitely illustrated.

THE HENNEPIN CANAL.

WASHINGTON, Aug. 15.—Secretary Lincoln has given orders to the engineers to proceed at once with the survey of the Hennepin canal, and the work will be done, it is expected, in time to report to Congress this fall. The contest will then be opened again, and an effort will be made to defeat an appropriation to begin the actual work on the canal. The railroad lobby will be here again, and the expert band of these monopolies will be easily detected in the progress of the opposition. It is believed that the report of the engineers will recommend an appropriation of about $500,000 for expenditures next year on the excavation, provided the people of the State vote to turn the Illinois and Michigan canal over to the government.

A REMARKABLE VESSEL.

The schooner John Hancock, now at San Francisco, has a history which is worthy of publication. This vessel was constructed in 1850 at the Boston Navy Yard for a steam tug and water boat. Her machinery was made at the Washington Navy Yard. In the summer of 1851 the John Hancock was sent to Annapolis as a practice steamer for the benefit of the Naval Academy. In a short time she returned to New York. During the excitement of the Lopez expedition she was sent down to the Gulf armed with a brass six-pounder on wheels, and soon returned to New York, whence she was ordered to Boston. She was then brig rigged. In October, 1852, the Hancock had a new bow and stern of improved model given to her with suitable machinery for a war steamer of the third class to be used as one of the squadron under the command of Captain C. Ringgold in the survey of the China seas. After the expedition she went to California, and like many other old steamers, was fitted up for the lumber trade on the coast. In the spring of 1869 the John Hancock was rigged into a three-masted topsail schooner. She is a fast sailer, and has been carrying lumber most of the time for the last thirteen years. She is now wearing the same suit of copper on her bottom that was put on in the Boston Navy Yard in the year 1852. The copper has never been removed, The plank and seams are as good as when the copper was put on. The oakum in the seams is hard and good. The bottom is perfectly tight, and looks as though it might last for a long time to come.

MINES AND MINING.

A mineral is any homogeneous body that is a direct production of nature without the intervention of organic processes. A rock is a mixture of two or more minerals. The minerals are the letters of the alphabet with which the book of nature is written, or at least that volume which relates of her solid structure, while the rocks are the words of the language in which nature expresses her meaning in that book. Chemistry teaches us that the world is composed of elements. Now while some few minerals, such as diamond, sulphur, gold, silver and copper, consist of but a single element, by far the most minerals consist of combinations of two or more elements associated together in a very great variety and proportion. A mineral species comprises all mineral substances possessing the same or equivalent chemical composition, and a certain fixed group of chemical properties, such as crystal, form optical properties, etc. You will find numerated in works on minerology from 600 to 900 distinct mineral species.

Each of these minerals is charactized by a particular group ot chemical and physical properties, which distinguish it from all other minerals. The mineral is described by describing all its properties, and it is determined by determining each of its properties.

In Plumas county, California, veins of copper bearing ore exist that will yield from 20 to 40 per cent. of metal and are from two to thirty feet wide, easy of access, and with unlimited supplies of wood and water. Specimens of some of these ores have been assayed in the State University of California and were found to contain $62.50 per ton in silver.

The bullion product of the Comstock lode is variously estimated all the way from $300,000,000 to $450,000,000. Taking the mean as an average, we find that three mining districts of Nevada have enriched the world to the extent of $450,000,000 within the last score of years, or an average yearly output of $22,500,000.

The product for the Leadville district for the first six months of 1882, shows an increase over the corresponding period of last year of $1,298,682.

A reason for supposing Alaska is rich in mineral treasures is founded on the theory that it is within the direct mineral belt, which extends from Cape Horn through South America, Mexico, the United States and British Columbia, as far north as prospectors have gone, and then skipping Alaska (unexplored) is disclosed again, in Siberia.

The richest vein of silver in the world is at Potosi. It is situated on an elevation 16,000 feet above the level of the sea, in a region of perpetual snow. It has always been worked in a very rude manner, yet it has already produced $250,000,000, and shows no signs of exhaustion. The annual product of the silver mines of South America at the present time has amounted to $13,000,000, and their total product to the present time has amounted $2,386,000,000.—*Mining World.*

An attachment for dredging pumps has been patented by Mr. Robert M. Adam, of Charleston, S. C. The arrangement is for the purpose of preventing the machines being injured by large pieces of stone that may be raised. A grating is attached to the suction tube of the pump so that the water passing through the pump must pass through it. At the grating the tube has two opposite side branches that lead into large arms, each having a valve that closes the end next to the drums. Placed in each of the drums is a grated basket, and a switch plate at the junction of the two branches provides for directing the current to either of the drums. While the pumps are in operation the grating allows all the pieces that will not injure the pump to pass through, but the large pieces are turned aside by the switch plate into either drum. These drums are emptied when filled.

New Mexico is a new country, and we must not expect to find large bullion producing mines just yet, although a beginning has been made, especially around Silver City. The metals and minerals already known to exist in considerable quantities are notably gold, silver, copper, lead, coal and mica. Gold is found in greater or less quantities in many parts of the territory, in quartz and placers on barren plains, and in fertile valleys, the richest usually in the least desirable places, as, for example, the old and new placers some thirty or forty miles from here, where there are acres and acres of rich pay-dirt, but which without the aid of a large amount of capital, can not be extensively worked, owing to the scarcity of water. Silver is found also very widely distributed in its own ores, such as chlorides, or with those of other metals—lead, copper. etc. The chlorides are chiefly confined to the southern portion of the territory, beginning at about Socorro, extending down into old Mexico; such camps as Silver City, Shakespeare, and Gillspie being the most prominent. Every one who has had to do with chloride mines knows the changeable nature ot the veins—rich to-day, poor to-morrow—setting at naught all calculations as to quantity in sight and conjecture as to the probable future. There are few a of these mines already at work in earnest, with money to back them; for instance, the Torrence and the Ivanhoe. Silver in association with other ores is to be found in many places; the only question is, how low a grade will pay to work in every individual locality.

THE DENVER EXHIBITION.

The Denver Exhibition serves not only to set forth before the eyes of men samples of the precious ores with which the tough sides of the Rocky Mountains have been stored, but through the exhibition of new machinery and processes, the consorting together of mining engineers and experts, of mine owners and mine workers, it ought to result in speedy and visible improvement in the methods of developing mines and handling and treating ores. Gold and silver form important items in the list of American products. The director of the mint estimates the production of the two metals for the year ending June 30, 1881, at $78,600,000. Gold and silver mining in the rich mineral region of which Denver is the center is a business of sufficient magnitude to justify the issuing of a general invitation to the world to come and look upon its methods and their results. It is almost in the center of the great mineral belt which extends into the Black Hills of Dakota on the north and to the Mexican border on the south. The total gold and silver production for the fiscal year 1881 for the States and Territories whose mineral products are most conspicuous among the exhibits at Denver, namely, Arizona, Colorado, Dakota, Nevada, New Mexico, Utah and Wyoming—excluding California—amounted to $49,397,000, or about 62 per cent. of the total yield of all the mines in the country. Colorado, standing next to California in the production of precious metals, reported a yield of $18,400,000 for that year, and $20,200,000 in the preceding year. According to local estimates, more than $13,000,000 worth of bullion was turned out in 1881 in the smelting works about Leadville.

Besides gold and silver, Colorado has coal and iron in vast quantities availing the hand of the miner. These humbler products have been hitherto neglected, the hope of sudden fortunes in mining for the nobler metals having absorbed the attention, labor and capital of those who have gone to that State in search of wealth. But already there are important iron and steel works at Pueblo, a large part of their ore being obtained as an incidental product from the Leadville silver mines. Coal of a high grade is found in many parts of the State, and while it may be true, as is confidently asserted, that all the gold and silver mining operations in this wonderful region up to the present time are mere scratches on the surface not revealing more than one-half of one per cent, of what remains to be brought to light, it is certain that the mining craze wears off and the people of Colorado accustom themselves to take a sober view of the natural resources of the State, the stores of coal, iron, marble, limestone, and perhaps of petroleum, which are known to exist there will be reckoned among their greatest mineral treasures. Mindful of the important contribution of the railroads to the success of the Atlanta Exposition, the managers have secured the co-operation of the railroads traversing that belt, and their well arranged exhibits of timber, mineral and cereal products of the country through which they pass is said to add greatly to the interest of the display. There is a fair representation of mining machinery from New York and Boston. One of the most valuable results of the exposition will come from the opportunity it affords for a comparison of engines, pumping apparatus, stamp mills, etc. Vast sums ot money have been paid out for worthless machinery in the West, and the projectors of this exposition made special efforts to attract the manufacturers of all kinds ot machinery used in mining. Until within a few years there has been an enormous waste in the neglect of low grade ores. By the old processes these could not be made to pay for working, and were thrown into the dump heap. The cost of treatment has been materially reduced of late, however, and ores are now worked at a profit which were formerly rejected as rubbish.

MARKETS.

Office of Trade Review and Western Machinist.

Friday Evening, August 25.

FINANCIAL.

The borrowing demand has been less active, the movements of wheat having been lighter, and for the same reason the shipment of currency to the country has been moderate. Rates of discount remain steady at 7@8 per cent in banks and outside for prime paper; on prime collaterals money is obtained at 6 per cent. on call. The market for Eastern exchange has become stronger under the abundance of currency, but the counter rates remain steady at 1-20 per cent. discount buying and par selling. Between banks round sums sold to-day at 1-20 per cent. discount. Dealers buy commercial bills at 1-10 per cent. discount. Foreign exchange rules a little easier but closes firm. Local securities have been in good request.

New York.—Money on call has ruled 3@4½ per cent. Sterling exchange steady; sight drafts $4.89@$4 89½; 60-day bills $4.85@$4.85½. The stock has been by no means buoyant. Railroad bonds are unusually quiet and without any important changes. Government and State bonds are quiet.

IRON.

The transactions effected in pig iron have been fully up to quoted figures, and there are not wanting signs of increased activity. There is every indication that business is reviving. The orders placed are larger, buyers' purchases in many instances extending beyond immediate requirements. Desirable brands of Foundry Iron are very firm, and prompt delivery is the exception, as deliveries on old contracts tax the output to its fullest capacity. There is a little more doing in No. 2 Foundry, which, however, remains comparatively neglected. Gray Forge has sold pretty freely and supply is about equal to demand. Prices are firm. We repeat last week's figures: No. 1 Foundry, $23.50@$25; No. 2 Foundry, $22@$22.50; Gray Forge, $20@$21, at furnace. Mottled Iron is in plentiful supply, but there is little demand, and prices are quoted about $19. No business has been done in foreign Bessemer Pig, the nominal quotation for which is $24@$25. Values of Scotch iron are in favor of buyer. We quote: Eglinton, $23.75@$24; Carnbroe, $25; Coltness, $27@$27.50; Glengarnock, $25; Gartsherrie, $25.50@$26; and Langloan, $26.50@$27. Holders of rails are disinclined to part with stock at present rates. We quote steel rails, according to size of order, section, &c., $45@$47 at mill. For scrap, the quotations for which will be found in our Price List, there has been an improved business for future delivery. There is an increasing demand for muck bar, and prices, which may be quoted at $40.50@$41.50, are firm. There is an increasing business in wrought iron pipe, and prices are reported steady. Discounts on gas and steam pipe 57½ to 60 per cent., on boiler tubes 42½ to 45. The National Tube Works are getting fairly underway again and will soon be in full blast. In plate and tank iron the demand for prompt delivery is beyond the capacity of manufacturers to supply.

Cincinnati.—(Reported by Messrs E. L. Harper & Co.)—The market during the week has been active and strong. Leading brands of foundry and mill irons were freely taken at fifty cents per ton advance over prices of preceding week. A large sale of No. 1 Neutral Mill Iron was made at $22.50, 4 months. That buyers are satisfied with current prices is demonstrated in their readiness to contract for future consumption. Many of the independent furnaces decline to enter large orders for fall and winter delivery in anticipation of far better prices than prevail at this writing We quote as follows for four months: Hot blast foundry—Hanging Rock CC. No 1; $27@$28; Strong Neutral Coke, No. 1, $23.00@$24.00; American Scotch, No. 1, $23.00@$24.00. Grey Forge—Neutral Coke, No. 1, $22.00 @ $23.00; Cold Short, No. 1 Mill, $21.00@$22.00. Car Wheel and Malleable—Hanging Rock Cold Blast, $33@$35; Hanging Rock Warm Blast, $27 @$29; Lake Superior No. 1 and 2, $31@$32; Lake Superior, 3 to 6, $32.00@$34.00; Southern Car Wheel Iron, $35@$37.

Pittsburgh.—Foundry grades continue quiet; prices weak but nominally unchanged, and stocks by no means excessive. There is an increasing demand for manufactured iron, as there always is at this season of the year, but there is no particular activity, and if the mills get started up within the next month they will, it is believed, be able to catch the fall trade. Stocks as might be expected after a suspension of nine weeks are very much broken, and it is difficult at present to place an assorted order. Consumers of tank iron and boiler plate continue to draw supplies from other points.

IRON ORE.

The demand for Iron Ore is altogether confined to small orders from furnaces which make nothing but Pigs for nails or household ware. Otherwise the market is flat. As soon as the coal miners' strike is settled, a heavy business in the ore line may be looked for.

COPPER.

Quietude characterizes the market. We quote Lake Ingot at 18@18½c.; Baltimore at 17½c., and Arizona at 17½c. Trade in a jobbing way is dull at 18¾@19c. for Lake, 17½@18¾ for Baltimore, and ingot smelted by the Taunton Copper Company from Western ores is being jobbed here at 17¾@18c. The combination prices of manufactured copper are unchanged. We quote: Sheathing, 27c.; Braziers', 30@32c.; Bolt, 30c.; copper bottoms, 31@32c.; American yellow sheathing metal, 20c.; y. m. bolt, 22c.; English yellow sheathing metal, 16c. in bond.

LEAD.

The market has been inactive, The larger consumers are stocked. For refined, corroders are entering the market. We quote Common Domestic at 5c., and Refined at 5½c. The combination prices of manufactured lead are as follows: Bar, 6¼c.; pipe, 7¾c.; sheet, 8c.; tinned lined pipe, 15c.; tin pipe, 45c.; all less ten per cent.

SPELTER AND ZINC.

Transactions in spelter have been limited. Common Domestic commands 5¼c.@5½c., Silesian being nominally worth 5¾c. We quote: Bertha Refined, 8c., and Bergenport, 9¼c. Sheet Zinc is quiet, but firm at 7c.@7½c. In London the latest quotations for sheet zinc are £17@£17 2s. 6d.

ANTIMONY.

A moderately active business has been done at barely sustained rates. Hallett at 11c.@11¾c., and Cookson at 13c.@13¼c.

HARDWARE.

Seasonable goods meet with a fairly active demand, particularly agricultural implements and wagon and blacksmith supplies. There are no changes in values to record. A good number of buyers have visited the city the present week. A large business has been done in nails; the supplies from the mills are not equal to the maintenance of dealers' stocks. At a meeting of the Eastern nail manufacturers at New York, the card rate for 10d. to 60d. was advanced to $3.65, subject to the usual allowance of 10 cents per keg on orders of 200 kegs and over. The demand is very active, and leading sizes are in short supply. We quote on a firm maket, $3 55 @$3.65 per keg, net, for 10d. to 60d., according to size of order. Manufacturers of Strap and Hinges have confirmed existing prices. The Iowa Farming Tool Co., Fort Madison, Iowa, announces that it will hereafter sell Steel Goods on 60 days' time, with 2 per cent. discount for cash within 10 days. Other leading manufacturers of similar goods have also adopted these terms, and as its prime object is to relieve—by example—the jobbing trade of the various objectionable features accompanying the selling of such goods on the time formerly given, they trust that their course will be generally followed. By selling these goods in their proper seasons, at a positive price, on time common with other staples, and subject to no claims of any character at "settlement," it is certain that the condition of the trade will be far more healthy and satisfactory to all concerned, retailer as well as jobber.

COAL.

Lake shipments of coal have been considerable The quoted local prices are somewhat shaded. Stocks continue large. An improvement in prices can only come with the fall trade.

WOOL.

The supply of wool in the Eastern markets is steadily increasing. Choice lots of Ohio have been disposed of at 49c.; Ohio X and XX has brought 40@42c., and Ohio fine delaine, 44@46c., do. No. 1 combing, 47@49c.; choice medium unwashed clothing, 30@34c.; fine do do 25@36c.

The Lambert & Bishop Wire Fence Co., of Joliet, has been incorporated under the general law, with a capital of $300,000.

Cleveland Wholesale Prices.

HARDWARE.

Adzes.

Carpenter's.....per doz $18 40
Ship..... " " 18 75
Heavy railroad.... " " 19 50

Axes.

Hunt's.....₱ doz $ 9 50
Lippincott's Crown ₱ doz 9 00
Cut More ₱ doz 9 00
Peck's Double Bit ₱ doz 22 00
" Champion Blade ₱ doz 11 00

Anvils.

Eagle, Amer...per lb. 10c dis 20
Wright's.....10¼c@11c
Armitage's, Mouse Hole 9¼@9¾c
Trenton.....10¾c
Wilkinson's.....10¾c

Anvil Vise and Drill.

Millers Falls Co. $28.....dis 20
Cheney Anvil and Vise..dis 25&2

Vises.

Solid Box, list of July 1, '79, dis 35
Solid "Crown" (A. H. Hildick).....40 to 100 lb, 15c net
Solid, Peter Wright's.....15½
Solid, Wilkinson's.....13½
Parallel, Parker's.....dis 40
Saw Filers, Hopkins' ₱ doz $17.50, dis 10
Reading.....dis 45&10
Cowell Hand Vises.....dis 20
Richardson's Vise and Anvil.....dis 25

Augurs and Bits.

C S cut augers.....dis 40&10
do do do bits.....40&10
D C gimlet do Ives.....dis 50
Snells bits.....dis 40
Russell Jennings' augers dis 16⅔ &10&10
Cook's pat augur.....40&10

Animal Pokes.

Berea, per doz..... 4 00
Eagle, per doz..... 5 00

Apple Parers.

Domestic & Reading ₱ doz..$7 50
Turn Table..... 5 00

Bolts.

Machine.....dis 60
Bolt ends.....dis 60
Plow.....dis 50
Plow, R. B. & W.....dis 40
Cast Iron Barrel Shutter, etc.....dis 50&10
Cast Iron Chain (Sargent' list).....dis 60&10
Ives' Pat. Door Bolts..dis 50
Wrought Barrel.....dis 55&10
Wrought Square.....dis 55&10
Wr'g't Shut'r, all iron, Stanley's list.....dis 50&10
Tire, R. B. & W., new list.....dis 70&10
Stove, American Screw Co.'s.....dis 40
Bolt Ends.....dis 60

Bellows. Dis

Blacksmith's com new list, 45₱ct
Moulder's new list, dis 25 ₱ cent
Hand, new list, 25 per cent

Butts. Dis

Wrought brass.....65&10
Cast, loose joint.....10&10
Pin, japanned and silver tipped.....45&10
Wrought, fast joint narrow.....40&10
Wrought fast joint broad.....40&10
Wrought loose joint broad.....45&10
Wrought table and back flaps.....40&10
Loose joint, reversible.45&10

Cleveland Stamped Elbows

Genuine Russia Iron

4 inch per doz..... 4 50
4½ do do..... 5 50
5 do do..... 7 50
5½ do do..... 8 50
do do..... 9 50
do do.....11 00

Planished American Russia Iron

inch, per doz..... 4 00
4½ do do..... 5 00
5 do do..... 6 50
5½ do do..... 7 50
6 do do..... 8 50
do do..... 9 50

Charcoal Iron

4 inch, per doz..... 2 00
4½ do do..... 2 50
5 do do..... 3 50
5½ do do..... 4 00
do do..... 4 50
do do..... 5 50
25 per cent

Chisels.

Hot and cold cutting.....₱ lb 30
Railroad track..... 30
Machinists..... 30
Mallet head..... 50
Tape..... 50
Packing..... 50
Stone cutters..... 50

Crowbars.

Cast steel.....₱ lb 8¼
Iron, steel points.....6¾c

Cutlery, Pocket and Table.

Meriden Cutlery Co., table..net
Am. Miller Bros.' Cutlery Co.....dis 25
Humason & Beckley, pocket 33⅓
Naugatuck Cutlery Co...list net
Aaron Berkenshaw's pocket dis 25

Coopers' Tools.

Bradley's.....dis 14@20
Barton's.....dis 20

Chains.

Coil by cask.....

3-16	¼	5-16	⅜	7-16	½
10½	9	8	7	6¾	6¼

Drills and Drill Stocks.

Blacksmiths', each...$2.50 dis 10
Blacksmiths', self-feeding, each 7.50 dis 20
Breast, P. S. & W.....dis 20&10

Drawing Knives.

Witherby's.....dis 65@10
Nobles Mfgr. Co.....15
Adjustable handle.....20

Emery and Emery Paper.

Regular Numbers.....₱ lb 6c
Flour and F. F.....₱ lb 4c
B. & A. Emery Paper..dis 30&5

Enameled and Tinned Ware.

Kettles.....dis 50
Sauce Pans.....dis 25
Tinned Sauce Pans.....dis 50

Files.

Auburn...$5 to £. dis 35 pr cent
E. M. Boynton's, new list..dis 25
J. & Riley Carr.....4.50 to £.
Johnson & Bro.....dis 30
Butcher's.....4.50 to £.
Walter Spencer & Co.'s "Diamond".....4.50 to £.
Fisher's.....4.75 to £.
Moss & Gamble.....4.50 to £.
H. Disston & Sons (new list).....dis 40 per cent
Heller Bros.' Horse Rasps dis 25
Nicholson.....dis 40
New American.....dis 40
Union File Co.....dis 40

Grindstones.

Ohio.....1½@1¾ ₱lb
Nova Scotia.....1¼@1½ ₱lb

Hammers.

Maydole's.....dis 15
Cheney's.....dis 25
Hartford Hammer Co.....dis 20
Humason & Beckley.....dis 50
Verree.....dis 5
Magnetic Tack, Nos. 1, 2, 3, $1.25, $1.50 and $1.75, dis 25&10
Nelson Tool Works...dis 40&10
Warner & Noble's.....dis 5
Kip's.....dis 15
Yerkes & Plumb.....dis 15
Wilkinson's Smiths' 11½c ₱ lbnet

Hatchets.

Yerkes & Plumb:--Shingling, Nos.....1, 2, 3, ₱ doz $7 50, $8 00, $8 50, dis 25
Claw, Nos.....1, 2, 3, ₱ doz $8 25, $8 75, $9 25, dis 25
Lathing, Nos.....1, 2, 3, ₱ doz $7 50, $8 00, $8 50, dis 25

Nails.

20 to 60d	3 40
8 and 9d	25
6 and 7d	50
4 and 5d	75
3d	1 50
2d	2 75
3d fine	3 00
2d fine	3 75
⅞ inch	3 00
4d barrel	1 00
1½ inch barrel nails	1 50
1¼ do do do	1 75
1 do do do	2 50
⅞ do do do	3 00
Cut spikes, all sizes	25
Clinch nails, all sizes	1 75
Casing and box nails 75 cts advance	
Finishing nails, $1 25 do	
Tobacco nails, 50 cts do	

Nuts and Washers

Nuts, square.....7c off list.
Nuts, hexagon.....6c. off list.
Washers.....6c off list.

Picks.

Railroad, 4 to 5 lbs...doz $7 75
5 to 6 lbs... 7 75
to 7 lbs... 8 50
7 to 8 lbs... 9 50
Railroad Tamping Pick 7 to 8 lbs..doz 13 50
Mill Picks per lb.....75c

Rivets.

Iron.....dis 40
Tinned.....dis 40
Copper.....dis 33⅓

Squares. Dis

Steel or iron, case lots.....50
Try squares and T bevels.....40

Spikes—WROUGHT

All lengths by ¼ inch.....4½c
do do do 5-16.....3½
do do do ⅜, 7-16 & ½in 3¼

Shovels and Spades.

Ames' new list, July 1, 1881.....dis 15
Old Colony.....dis 15
Remington's (Lowman's Patent).....dis 30
Rowland's.....dis 40 and 10
Griffiths.....dis 40&10

Saw Sets.

Boynton s patent X Cut, per doz $12; Hand Saw, per doz $10.....dis 20
Stillman's Genuine, per doz $3 50 and $5 50.....dis 20
Stillman's Imitation, per doz $3 25.....dis 20&10
Common Lever, per doz $2 dis 30&10
Leach's No. 0 $8; No. 1 $15; dis 15
Hammer, Hotchkiss $5 50, dis 10
" Bemis & Call Co.'s new patent.....dis 40&5
Bemis & Call Co.'s Lever and Spring Hammer..dis 30&5
Bemis & Call Co.'s Plate..dis 10
" " Cross-cut dis 12½
Aiken's Genuine...$18, dis 50&10
" Imitation.....$7, dis 50
Hart's Patent Lever.....dis 20
Disston's Circular.....dis 40

Sad Irons.

From 4 to 10 lbs....per lb 3¾ net
Self-Heating.....₱ doz $9 net
" Tailors..₱ doz $18 net
Gleason's Shield and Toilet.....dis 25
Mrs. Pott's Irons, double pointed.....dis 35
Mrs. Pott's Irons, square back.....dis 35
Enterprise Star Irons.....dis 40
Combined Fluter and Sad Iron.....₱ doz $15, dis 15

Scales.

Hatch, Counter, No. 171...
₱ doz. $42, dis 37½ &10
Union Platform.....$6, dis 45
Fairbanks'.....dis 20
Buffalo Scale Co.....dis 20&5
Forsyth Scale Co.....dis 25
Howe's.....dis 20&10
Chatillon's Eureka.....dis 25
Family Universal.....dis 50
Scale Beams.....dis 33⅓&10

Bag Holders.

Sprengle's Pat, $18.00 per doz 40 per cent. dis.

Planes.

Ohio Tool Co.....dis 25
Sciota.....dis 30
Bailey's Pat. Adjstble..dis 20@25

Rules.

Stanley.....dis 66⅔ and 10

Sash Locks. Discount.

Payson Mnfg. Co. "Perfect"..42
Simmons' Sash Supporters....20

Hinges.

Champion double acting spring hinges.....dis. 30
Screw & Strap 8@12 in.....$6. net
Gravity Locking Blind Hinges, Sargeant & Co. 70&10

Screws. Dis

Flat head iron or steel per cent dis.....30
Flat head brass.....30
Round head iron or steel..25
Round head brass.....20
Brass and Silver capped..40
Japanned, list of Plain Screws.....20
Coach, patent Gimlet point, list per 100.....60
Lag, taper points.....60
Bed.....10
Machine, flat head, iron..55
round head, iron 50
Bench, iron.....55&10
wood, beech, per doz $3.....10
wood, hickory.....20&10

Valves. Dis.

Jenkins' Patent Gate Valves..35
" " Globe " ..40
" Standard Packing " ..20

Wrenches.

Coe's genuine.....40 & 10
Coe's imitation wrought bar..60
Mechanics' 60 and 10

Wire.

Brass and Copper.....dis 20
Bright & annealed, Nos. 0 @ 18 dis 50@52½
" " Nos. 19 @ 26 dis 60
" Nos. 27 @ 36 dis 65
Coppered.....Nos. 0 @ 18, dis 45
Galvanized, Nos. 0 @ 18, market list,.....dis 40@42½
Tinned, Nos. 0 @ 18,.....dis 40@45
Cast steel.....dis 40
Tinned Broom Wire, Nos. 18 @ 25.....dis 55
Annealed Fence, Nos. 8 and 9.....dis 55@52½
Annealed Grape, Nos. 10 to 14.....dis 52½
Galvanized Telegraph, Nos. 7 to 9.....₱ lb 7¼c
Galvanized Telegraph, Nos. 10 to 11.....₱ lb 8¼c
Galvanized Telegraph, No. 12.....₱ lb 10¼c
Fence staples.....₱ lb 5½@5¾c
Fence Staples, galvanized, ₱ lb 7@7½c
Stubs Steel Wire.....$7 00 to £
Barb Wire, painted.....8¼c
Barb Wire, galvanized.....9½c
Crucible Steel Ropes from ⅜ in. at 9c to 1¼ in. at.....52c
Best Selected Iron Ropes from 3-16 in. at 8c. to 1¼ in. at.....33c

Boiler Plates.

("Gaylord"--Standard Quality.)

C. No. 1	4 50
C. H. No. 1 Shell	4 75
C. H. No. 1, 50,000	5 25
C. H. No. 1, 55,000	5 75
C. H. No. 1 Flange	6 50
Firebox	
T. S., 60,000.....(as per)	6 50
T. S., 65,000.....(act of)	

Homo. Steel, 70,000 (of Cong).7 50
Heads, ½c ₱ lb. extra.
N.B.—Eastern brands of boiler plate at from 2-10 to 3-10c ₱ lb less than above prices.

Sheet and Tank Rivets. "Norway."

All sizes.....dis. 15

Boiler Rivets—" Albany."

½, ⅝, 11-16, and ¾ in. diam.5 50

Boiler Makers' Tools.

Doty's Power Shears....net list
" Hand Lever Shears.net list
" Power Punch.....net list
" Hand Punch.....net list
Steel Screw Punch.....net list
Iron Screw Punch.....net list
Boiler Plate Rolls.....net list
Buffalo Forges & Blowers dis 20
Watson's " " net list
Spring Tube Expander....dis 15
Roller Tube Expander..net list
National Tube Cleaner...dis 20
Wire Flue Brushes.....net list
Anvils—"Peter Wright" 12½ ₱lb
Solid Box Vises.....net list

Nuts, Bolts, etc.

Square & Hex. Nuts....7 off list
Washers.....list
Machine Bolts.....dis 60
Bolt Ends.....dis 60
Boiler Patch Bolts.....net list

Boiler Tubes.

"National" Standard Gauge 1 inch to 10 inch.....dis 37½
"National" Standard Gauge 11 inch to 15 inch.....dis 25
"National" Special Locomotive Tubes.....net list

IRON AND STEEL.

Flat Bar.

1½ to 4 by ¾ to 1 inch	2 60
4¼ to 6 by ¾ to 1 inch	2 70
1¾ to 6 by 1¼ to 1¾ inch	3 00
1¾ & 1¾ by ¾ to ¾	2 70
1 & 1¼ by ¾ to ¾	2 80
⅝ ¾ and ⅞ by ⅜ to ½	3 00

Round,

1 to 1⅞ inch	2 60
2 to 2¾	2 80
2¾ to 3¼	3 10
3¾ to 4	3 60
4¼ to 4½	4 10
4¾ to 5	4 30

Square.

1 to 1⅞ inch	2 60
2 to 2¾	2 80
2¾ to 3¼	3 10
3¾ to 4	3 60
¾ to ⅞	2 70

Heavy Band.

1¾ to 6 by ¾ and 5-16 inch	2 80
1 to 1¾ by ¼ and 5-16 do	2 90
¾ to ⅞ by ¼ and 5-16 do	3 10
⅝ to ¼ by ¼ and 5-16 do	3 60

Half Oval and Half Round.

Wagon box iron ¾ and ⅞.. 4 10
1-10c per lb extra will be charged for cutting to specified lengths

Light Band.

1¾ to 6 by ¼ to 3-16..... 3 10

Hoops.

1¾ to 2 , Nos 16 to 18	3 50
1¾ to 4 do 13 to 15	3 40

1-10 extra for each gauge lighter

Sheet Iron.

No 22 to 24	4 50
No 25 to 26	4 70
No 27	4 90
No 28	5 30

English Steel.

Best cast.....₱ lb	15½c
Extra cast	16½c
Round-machinery, cast	10c
Swaged, cast	18c
Best double shear	15½c
Blister, 1st quality	13c
Refined tool steel	16½c
Spring calking	7¼@7½c
German steel, best	11c
2d quality	10c
3d quality	9c
Sheet cast steel, 1st quality	15½c
2d quality	14½c
3d quality	13½c

American Steel.

Best brands of refined cast steel, ¾ to 2 inches	12c
Crucible cast	7c
Open-hearth ditto	4½c
Hammer cast steel	9c
Spring cast steel	7½c
Bessemer and open-hearth spring	5c
Ditto plow	4½c
Steel boiler plate	6¼@7c
Bessemer machinery	5 @6c
Spring and calking	7¼@7½c
Tire	5
Sleigh shoe	5

Bessemer Steel Tire.

¾ to 1 by 3-32	4½ ₱ lb
¾ to 1 by ½ to 5-32	4½ ₱ lb
¾ to 1 by 3-16 to ¾	4½ ₱ lb

Miscellaneous Cast Steel.

Auger and auger bit	1
Axle steel for wagons	7
Frog points and plates	8
Frog size bars	8½
Pick, hammered	10
Mattock, beveled	9
Table cutlery	7½
Trap spring steel	10
Pike and cant hook	9
Coal and granite	8½

TINNER'S STOCK.

Tin.

Banca	per lb.	28@29c
Straits	"	24@25c
English	"	24@25c
Bar	"	27c

Tin Plate,

IC 12x12 charcoal	$ 6 50
IC 14x20 do	6 25@6 50
IX 14x20 do	8 25
DC 12½x17 do	6 00
DX 12½x17 do	8 00
DXX, 12½x17 do	10 00
DXXX, 12½x17 do	12 00
IC, 20x28 do	14 50
IX, 20x28 do	15 50
IC, 14x20, Best Roof	6 00
IX, 14x20, do	8 00
IC, 20x28 do	13 00
IX, 20x28 do	14 50
IC, 10x14 Best Coke	5 75

Solder.

Half and Half, in bars	15½
No. 1 do	14½
Spelter Solder	25

Pat Planished Sheet Iron.

{A}	per lb 10½c
{B}	9½c

Nos	10	15	21	25
to	14	20	24 & 26	
Com	3-60	3-80	4-00	4-20
Char	5-60	5-60	6-00	6-20

Sheets over 28 in. wide ¼c extra

Zinc.

Sheet, cask	7½@ 7¾
Sheet, open	8@ 8¼

Tinners' Tools & Machines

Machines (P. S. & W.) list add 20
Tools (P. S. & W.).....add 6

Plumbers', Steam and Gas Fitters' Supplies.

Wrought Iron Pipe	dis 60.
Steam Brass Goods	dis 45
Water " "	dis 40
Enameled Pipe	dis 65
Artesian Well Casing	net list
Hydraulic Tubes	net list
Malleable Iron Fittings	net list
Cast Iron Fittings	dis. 45
Globe Valves	dis. 35
Angle Valves	dis. 35
Check Valves	dis. 45
Safety Valves	dis. 35
Ludlow Gate Valves	dis. 20
Ball Gauge Cocks (net per dozen)	$15
Compression Gauge Cocks	dis. 35
Montg'ry Gauge Cocks	dis. 35
Register Gauge Cocks (net per piece)	$1 00
Cylinder Cocks	dis. 30
Air Cocks (net per dozen)	$2 75
Oil Cups	dis. 30
Steam Gauges	dis. 40
Water Gauges	dis. 40
Scotch Glass Tubes	dis. 50
Steam Whistles	dis. 45
Pipe Tools	special
Globe, Angle and Check Valves (Star's regrinding)	dis. 25
Duplex Injectors	net. 20
Soil Pipe & Fittings	dis. 20
Sinks	dis. 25
Bath tubs &c	dis. 20

Babbitt Metal.

No. 1.....₱ lb	16
" 2..... "	14
" 3..... "	10
" 4..... "	8

LEAD.

American, ₱ lb	5¼c
Bar, ₱ lb	6¼c dis 10 per ct
Pipe, ₱ lb	7¼c dis 10 per ct
Sheet, ₱ lb	8c dis 10 per ct
Tin-lined pipe ₱ lb	15c dis 10 per ct
Shot Drop 7c; Buck	7c
Chilled Shot	8c

COPPER.

Lake Ingot	18¼@18¼c
Baltimore	17¾c
Arizona	17¾c

Sheathing Braziers Copper, Bolts, &c.

Brazier's Copper, ordinary sizes, 16 oz. per sq. foot, and over per lb.....30c
Brazier's Copper, ordinary sizes, under 16 oz. and over 12 oz. per sq. foot, per lb. 32c
Brazier's Copper, 10 oz. and 12 oz. per sq. ft...per lb. 34c
Brazier's Copper lighter than 10 oz. per sq. ft...per lb. 36c
Circles less than 84 inches in diameter.... per lb. 33c
Circles 84 inches in diameter and over.....per lb. 30c
Segment and Pattern sheets per lb. 33c
Locomotive Fire Box sheets per lb. 30c
Sheathing Copper, over 12 oz. per sq. ft.....per lb. 28c
Bolt Copper.....per lb. 30c
Copper Bottoms..per lb. 31@32c

No copper is Sheathing except 14x10 inches, and not to exceed 34 oz. to the sq. ft.

Tinning.

14x18.....per sheet 6c

All other size sheets, 2½c per square foot. For tinning both sides, double the above amount.

SCRAP IRON AND OLD METAL

DEALER'S SELLING PRICES.

	Net Tons.
No. 1 wrought scrap	$24
Sheet and hoop "	10@11
Cast scrap, (No. 1 heavy)	19
Cast Scrap (Stove Plate)	12

OLD METALS.

Old copper per lb	15c
No. 1 H. Brass per lb	14
Heavy yellow Brass do	12
Light Brass per lb	12
Scrap Zinc per lb	6
Tea Lead per lb	4
Heavy Lead per lb	3

PIPE, WROUGHT.

Standard Wrought Iron Lap Welded Steam and Gas

Inside Diameter. Inches.	Plain, Price Per Foot.	Galvan. or Enameled Per Foot.	Outside Diameter Inches.	Weight Per Foot.
⅛..	08		.40	.24
¼..	08	$0 11	.54	.42
⅜..	09	12	.67	.56
½..	11	15	.84	.85
¾..	13½	19	1.05	1.13
1..	19	28	1.31	1.67
1¼..	27	40	1.66	2.26
1½..	33	47	1.90	2.69
2..	46	64	2.37	3.66
2½..	75	1 00	2.87	5.77
3..	95	1 30	3.50	7.55
3½..	1 25	1 70	4 00	9.05
4..	1 50	2 05	4.50	10.73
4½..	1 75	2 40	5.00	12.49
5..	2 25	3 00	5.56	14.56
6..	2 75	4 00	6.62	18.76
7..	3 75	....	7.62	23.00
8..	4 75	....	8.62	28.00
9..	6 50	....	9.68	34.40
10..	8 00	....	10.75	40.64
12..	12 00	....		54.65

Discount, 62½ per cent; galvanized, 62½ per cent.

BRASS.

Cash prices for Roll and Sheet Brass. For less quantity than 100 lbs. add 3c per lb.

High Brass.

All Nos. not thinner than to No. 28, wider than 2 in. not wider than 14 inch.....30c
All Nos. to No. 28, inclusive, and widths over 14 to 20 in. inclusive.....35c
All Nos. to No. 28, inclusive, and widths over 20 to 30 in. inclusive.....38c
½c per lb. advance on each No. above Nos. 28 to 38, inclusive.
All Brass thinner than No. 8 is Platers' Brass at.....33c
Sheets 24x48, and all sheets cut to particular sizes and lengths under 30 inches, in width wider than 2 inches.37c

Low Brass.

4c per lb. more than High Brass.
Gilding metal 8c per lb. more than High Brass.
Platers' or Gold Metal
In Bars.....48c
Sawed.....51c
Planed or Polished...54c

For Slitting.

Metal in width in. to ½ in. to No. 28, inclusive, 1c per lb advance.
Metal, in width 2 in. to 1 in., thinner than No. 28, 2c per lb. advance.
Metal, in width ½ in. to ¼ in. thinner than No. 28, 3c per lb. advance.
Metal ¼ in. in width and less, 10c per lb. advance.
Any of the above widths cut to particular lengths, add 7c per pound.

COAL,

WHOLESALE.

Wholesale f.o.b. vessel at Cleveland:

Carbon Hill and Monday Creek	$2 65
Massillon	2 75@ 2 85
Brier Hill	3 25@3 75
Pittsburgh	3 00
Salineville	2 25
Tuscarawas	2 25

RETAIL.—Delivered.

Massillon Lump	$4 00
" Nut	3 75
Carbon Hill and Monday Creek, lump	3 75
Carbon Hill and Monday Creek, nut	3 50

75c less on cars by car load.

Anthracite Stove and Chestnut	7 15
Egg and grate	6 00

GLASS.

(Per box of 50 feet)

SINGLE THICKNESS

6x8 to 10x15	
11x14 to 15x24	8 50
16x24 to 20x28	9 75
15x34 to 24x30	10 75
26x28 to 24x36	11 50
26x36 to 26x44	13
26x46 to 30x50	14 00

DOUBLE THICKNESS

6x8 to 10x15	11 7
11x14 to 15x24	13 25
16x24 to 20x28	15 75
15x34 to 24x30	17 25
26x28 to 24x36	18 50
26x36 to 26x44	21 25
30x50	22 50
30x52 to 30x54	23 25
30x56 to 34x56	25 00
34x58 to 34x60	27 75
36x60 to 40x60	30 00

Dis 60 & 15 single, 60 & 20 double

OILS.

Pure Oils. packages included

Sperm, winter bleached per gal	1 25
Whale, winter bleached per gal	93
Straits	50@53
"A" oil for tanner's use	35 @40
Lard oil extra W S	1 05@1 10
do No 1 do	82@87
do No 2 do	72@77
Tallow oil	75
Neatsfoot oil pure	90@95
do No 1	80@85
Linseed oil, raw	
do do boiled	
Cotton seed oil white	64 @ 66
do do yellow	60 @ 62
West Virginia lubricating 28 deg	20c@30c
Pure Mecca	55@ 60
Paraffine oil winter pressed	25@ 30
Machinery	40
Engine	30
Miners' oil	40@45
Drilling oil	40

Hides and Leather.

Prime cured hides,	8@8¼
Green hides	5@6
Bull, scrubby, badly scored or damaged, cured, two-thirds price.	
Prime dry hides	13@14
Horse hides, green	$1 75@2 00
Horse hides, dry	12 00
Prime cured veal calf,	18
Prime Deacon S, salted	65@70
Pelts, wool on	25@30
Fresh slaughter sheep	30@$1 50
Fresh slaughter lambs	50@60
Green calf skins	13
Hemlock rough	23@24
Oak harness	34@38
Oak sole	37@40
Union harness	31@34

Cleveland Business Directory.

Assayers and Analytical Chemists.

JUDSON, W, E, Analytical Chemist, 8 Cushing Block.

Bolt and Nut Works.

HOTCHKISS & GAYLORD, manuf'rs. Machine, Plow & Elevator Bolts, Coach Screws.

Boiler Makers.

SMITH & TEACHOUT—(Established 1857.) Boiler, Tanks, Stills etc. 439 Broadway.

Bridge Builders.

BUCKEYE BRIDGE AND BOILER WORKS mfrs of Arch & Truss Bridges, Boiler Tanks and Oil Stills. Bet. Wasson St. and Case Ave.

Coal and Iron Exchange.

JACKSON IRON CO. Iron Ore and Pig Iron. Rooms 8 and 9. Fayette Brown, Gen. Agent.

RHODES & CO. Coal, Iron Ore an Pig Iron. Rooms 1 and 2.

Carriage Blacksmith.

STRIEBEL, CHAS. manfac'r. of Carriages and Wagons and platform trucks. Horse shoeing and general blacksmithing .93 Woodland ave.

Carriage Bolts.

THE COLWELL & COLLINS NORWAY BOLT CO., manufacturers of Philadelphia Carriage and Tire Bolts.

Church and School Furnture.

FAULHABER, GEO. manufacturer of School and Church Furniture. Fine Hard Wood work a specialty. 203 Ontario Street.

Custom Boots and Shoes.

ROONEY, JOHN manufacturer of hand-made Boots & Shoes, custom made and warranted 177 Ontario Street.

Carriage Repository.

GREENE'S, J. O., Carriage Repository, 408 Superior street and 52, 54 & 56 Rockwell street, dealer in Fine Carriages. Repair shop in connection.

SLATER, G. A., Carriage dealer, sells the best work for the lowest price. A fine assortment always on hand. Repository 365 Euclid Avenue.

Coal and Pig Iron.

ANDREWS, HITCHCOCK & CO., Briar Hill Coal and Pig Iron. 122 Water Street.

Electrical,

ELECTRIC SUPPLY CO. manfrs and dealers in Electric Burglar Alarms, Anunciators, Cell Bells and Batteries. Telephone lines built and repaired. 145 Seneca Street.

Fresco Artists.

KEMMER & KUSHMAN DECORATIVE CO., Fresco Artists, Fine Modern Wall Papers. 338 Euclid ave.

Foundries.

BOWLER & CO., Car Wheels, Patent Chilled Frogs, and all kinds of castings. 9 Winter.

CLEVELAND MALLEABLE IRON CO., manufacturers Malleable Iron Castins.

LAKE SHORE FOUNDRY, Water and Gas Pipe, Light and Heavy Castings. Alabama st.

TAYLOR & BOGGIS, successors to H. & H. F. Taylor, Iron Founders, 65 to 73 Central Way.

VIADUCT FOUNDRY COM'Y, Aenis, Carlin & Strangward manfrs of Machinery Castings Fine Light Castings a Specialty. Office & Works 11 13 15 and 17 Detroit Strert, near Center.

FITZSIMONS WM. & SON, Rolling Mill and Machinery castings. Rolls a Specialty. No. 435 Broadway.

File and Saw Works.

PARKIN, W. H. & CO., Hand-cut Files and Rasps, dealers in Disston's saws, 11 So. Water

Flue Cleaner.

CLEVELAND FLUE CLEANER M'F'G. CO. manufacturer of Aitchison & Doolittle's Patent Steam Flue Cleaner, 22 & 24 Power Block.

Hotels.

FOREST CITY HOUSE, cor. Public Square and Superior st., Terrill & Ingersoll, Props.

KENNARD HOUSE, D. McClasky, Prop.

NEW ENGLAND HOTEL, Water st., W. W. Wolcott, Prop. Refitted and refurnished.

STRIEBINGER HOUSE, between Ontario and Seneca sts. $2.00 per day. Hawley & Langton

CITY HOTEL, Seneca street. H. B. West, proprietor. $1.50 per day.

Hides, Pelts and Leather.

DENNISON BROS., dealers in Hides, Pelts, Furs and Tallow, 48 and 50 River street.

Hardwood Lumber.

MARTIN, J. T. dealer in Hardwood Lumber, Stone's Levee, near Central Way.

Lumber.

WOODS, PERRY & CO., manufacturers and dealers in Lumber, Lath, etc., 5 Carter st.

FISHER, WILSON & CO., wholesale lumber dealers (pine & hard wood), rough and dressed lumber, timber, lath, shingles, etc. 47 Central Way

KRAUSE, C. A., & SON, wholesale and retail dealers in lumber. Yards cor. Superior and Wason and 281 Merwin streets.

Cleveland Business Directory.

Hardware and Iron.

BINGHAM, WM. & CO., Hardware, Iron, Nails and Metals, 148 and 150 Water street.

CLEVELAND ROLLING MILL CO., manuf'rs. of Steel and Iron Wire and Steel Tire.

WORTHINGTON, GEO. & CO., Hardware and Dealers in Metals. Water street.

Lime Manufacturers.

RUSSELL LIME CO., manufacturers of White Lime; also dealers in Plaster, Cement, etc. 85 Elm street.

Machinery and Boilers.

CLEVELAND STEAM FURNACE CO., Engines and Boilers, cor. Detroit and Center sts.

KRITCH, K. E. Metal Pattern Maker. Small machinery repaired. Lawn Mower sharpening a specialty. 42 South Water Street.

Machinery Depot.

CLEVELAND MACHINERY DEPOT, (now National Machinery Depot.) The largest stock of New and Second-hand Engines, Boilers and Machinists' Tools. Shop and Warehouse corner Bond and Superior streets.

Mercantile Agency.

THE MERCANTILE AGENCY. R. G. Dun & Co. proprietors. 121 Superior street.

Oil Manufacturers.

AMERICAN LUBRICATING OIL CO., manufacturers of lubricating oils, 23 Euclid ave.

Paints and Oils.

MASTERS, J. N. jobber in Paints, Oils, Varnishes. Brushes, 34 Prospect st.

Pattern and Model Makers.

WHITTINGHAM, J. & C., Metal Pattern and Model makers. 52 Canal Street.

REID, J. C., Pattern and Model Maker. 52 Canal Street., (Up Stairs.)

COTTRELL & CO., W. L., Pattern Makers, 53 Center street.

STAIR BUILDER.

PFEIL, CHAS, Stair Builder; Hard Wood Mantles and Office Railing. Works, 49 & 51 Canal street, Cleveland, Ohio.

JOHNSON & PURSER, Stair Builders. and manuf'rs of Mantels, Odd Pieces of Furniture, &c. 30 West street, up stairs.

Steel Stamps and Stencils.

FLEHARTY, J. H. & CO., Rubber Stamps, Seals, Stencils. 197 Superior street.

Tanners.

GAENSSLEN BROS., Tanners, and dealers in leather, oil and shoe findings. 80 Water-st.

Trunks and Valices.

FABER, J. manuf. Trunk, Traveling Bags and Ladies' Fine Satchels. Sample Trunks and Cases a Specialty. 56 Public Square.

Vessel Agents.

WEBB, H. J. & CO., Ship Brokers and Vessel agents. 17 & 18 Board of Trade Building. 122 Water Street.

Wood Carving.

HERKOMMER, J., Carver and Ornamenter in Composition. 225 Erie street.

Business Directory.

Akron, O,

AKRON IRON CO., manufacture best Common, Refined and Charcoal Iron.

CASCADE HOUSE, cor. Mill and Summit sts., near Depot. J. Downie, Prop.

MCNEIL, J. C., Steam Boilers, Heavy Sheet Iron Work. Repairing promptly executed.

PERKINS, C. E., dealer in Agricultural Implements, machinery, and Manufacturers' Ag'nt

TAPLIN, RICE & CO., manuf'rs. of Stoves and Hollow Ware, dealers in Tinners' Stock, etc.

WEBSTER, CAMP & LANE MACHINE CO., Founders and Machinists, 12 Main street.

AKRON POLISHING & PLATING WORKS.

Alliance, O.

ARLINGTON HOUSE, cor. Main and Liberty Streets. Centrally located. Sample Room for Commercial Travellers. H. S. Adams, proprietor

MCFARLAND, J. W. Engine and Machine Builder, and General Machine Jobbing.

Cuyahoga Falls, O.

THOMAS BROTHERS, manfrs of Ohio Stone Ware. Cuyahoga Falls Stone Ware Factory, cor. Main and Broad streets,

TURNER, VAUGHN & TAYLOR, manufacture engines, presses and grinding machinery for clay; also paper, chain, wire and flour mill machinery. Send for Circulars and price list.

SNYDER, H. wholesale manufacturer of Sash, Doors, Blinds, &c. Send for Price Lists.

THE CUYAHOGA FORGE AND IRON CO., manfrs. of every description Car, Truck and Driving Axles, Forging, Shafting. &c.

Canal Dover, O.

HECKMAN, E., manufr. and dealer in harness leather, upper, kipp and calf. Also, manufacturer & dealer in prime English Dairy cheese. Highest market cash price paid for hides.

Business Directory.

Columbus, O.

PAT. ADJUSTABLE WINDOW CURTAIN Cornice, manufactured by Strader's Curtain Cornice Works.

ROYCE & PULLING manufrs of Patent Steam Pumps for all purposes. Store room 30 High street. Works Nos. 5 and 7 Scioto street.

U. S. CARRIAGE CO. builders of fine Carriages, Buggies and Phætons. Salesrooms and Office 257, 259 and 261 Fourth street.

REYNOLDS BROS., manufacturers of hand-cut Files and Rasps. Old files re-cut. Send for Price List.

CITY BOILER WORKS, manfrs of Stationary, Portable and Locomotive Steam Boilers. All work warranted. Borger Bros. & Co.

MURRAY, HAYDEN & CO., manfrs of Malleable Iron. Cor. Randolph & West streets.

Canton, O.

DIEBOLD SAFE & LOCK CO., manuf'rs. Safes, Locks, Bank and Safe Deposit Works.

NOVELTY IRON WORKS, Mill work, Shafting, engines, Imperial job printing press, etc

NEW AMERICAN HOUSE, Canton. Fred. Hipp, Prop.

EBERSOLE & KAILEY, Machine and Jobbing Shops. Gearing for Patterns or Machinery a specialty. Models of all kinds made & repaired.

Geneva, O.

THE ENTERPRISE MACHINE CO., L. L. Crane, Pres't, manfrs of Machinists' Tools and Machinery. Gear Cutting a specialty.

Lima, O.

LIMA HOUSE, centrally located; telegraph office in the house. J. Goldsmith, Prop.

Massillon, O.

CITY CARRIAGE WORKS, P. H. Young, prop. manfact'r of Carriages, Phætons and Spring Wagons. Work warranted. Cor. Tremont & Erie.

Painesville, O.

NORTH AMERICAN CUTLERY CO., m'fr's of Steel Shears and Scissors—best quality.

Ravenna, O.

THOMPSON, T. F., dealer in Agricultural Implements, farm machinery, hardware, seeds, fertilizers, &c. Cor. Main and Prospect sts.

BALDWIN, D. L. & SON, Contractors & Builders and manfrs of all kinds of Moulding, flooring, siding, &c. Rip, Band and Scroll Sawing.

Steubenville, O.

DORRANCE, D.W., Tool Works, manufacturer of hand-made miners' and stone-cutters' Tools Promp attention given to mail orders.

Sandusky, O.

SANDUSKY WHEEL CO. manfrs. of Sarven Patent Wheels, Carriage Bodies and Seats, Plain Wood Hub Wheels, Banded Hub Wheels, Jacobs' Patent Neck Yokes.

Toledo, O.

BAKER, HERBERT, Machine Shop and Iron Foundry. 98 and 100 Erie street.

TOLEDO FOUNDRY AND MACHINE CO. builders of Steam Engines, Circular Saw Mills and all kinds machinery. Water St., cor. Cherry

RUSSELL IRON WORKS, manfrs. of Architectural Iron Work, castings, pulleys, shafting and steam bending machinery. Cor. Water and Lagrange streets.

STANDARD SAW WORKS, H. Bartley, manufacturer and dealer in Saws of every description. All kinds of Springs made from Sheet Steel. Reaper, Hay Knives Truss Springs, &c. made to order. 92 St. Clair Street.

UNION Wooden Ware Manufacturing Co. manufacture Sewing machines, washboards, children's wagons, carts, wheelbarrows, sleds, kitchen wooden ware, &c.

HEPBURN BROTHERS, proprie. Union Boat Works. Boats of all kinds made to order. For sale or rent. Water Street foot of Cherry.

Youngstown, O.

BELL, EDWIN & SON, manuf. of Nail Kegs, Pat. coiled hoops, slack barrel and keg heading and oil barrel stock.

DINGLEDY, G. H. dealer in rough and dressed Lumber, Shingles and Lath.

MORTON HOUSE, formerly Maitland House, James Morton, Prop.

TOD HOUSE, cor. Diamond and Market streets. Henkel & Bowman, Props.

Zanesville, O.

KIRK HOUSE, William Kirk, proprietor. $1.50 per day.

Rochester, Pa,

OLIVE STOVE WORKS, (limited) manufacturers of Stoves and Hollow Ware.

Erie, Pa.

ERIE STEAM BENDING WORKS. H. G. Fink, prop'r, manufacturer of Bent Felloes, poles, snafts, bob runners, etc. Cor. 12th & Cherry.

GUNNISON, A. B., wholesale manufacturer of Wood Pumps. 233 East Twenty-Second St.

BALL ENGINE CO., limited, manufacturers of Automatic Engines of 15 to 30 horse power

NOBLE SEWING MACHINE CO. manfrs of the New Noble Sewing Machine. Send for circulars and prices.

A. B. FELGEMAKER & CO. Church Organ builders. Descriptive catalogue furnished on application.

Business Directory.

Titusville, Pa.

FOSTER & McKAY, dealers in boilers and engines, tubing, casing, old iron, rope, and all kinds of metals. Washington street, nr. Railroad.

Meadville, Pa.

CURRY & CO. general jobbers in Castings of al kinds.

Oil City, Pa.

REID, JOS. Machinist, steam engine and pump repairing. Brass and sron castings, light and heavy, made on short notice.

Sandy Lake, Pa.

EBERMANN, W. S. & SONS, manfrs. of the celebrated Ebermann Boiler Feeder. Send for Circulars and Price List.

Pittsburgh, Pa.

PRINTING PRESSES. W. A. Bunting, manufacturers' agent. Printers supplies, type, cards. 42½ Sixth Street. [Up stairs.]

BAIR & GAZZAM, practical machinists; gear cutting a specialty. Rice's Feed Water and Heater. 17 Wood street, corner First Avenue.

Wheeling, W. Va.

EXCELSIOR MACHINE WORKS, Redman & Co., general machinists and manufacturers of Marine and Stationary Engines, Hangers, Pulties, Shafting, &c. Cor. 18th & Chapline streets.

Louisville, Ky,

HAIGHT, ROBERT, Gold, Silver and Nickel Plating and Brass Finishing Shop. Car Trimmings and Steamboat work a specialty. 1 West Market street

Union City, Ind.

LAMBERT, J. W. & CO., mfrs. of fork, rake, hoe and broom handles; spokes, hubs, whiffletrees, yokes, plow-rounds, &c. Correspondence solicited.

Olean, N, Y.

MYRICK BROS. & CO., manufact'rs Engines and Boilers, oil drilling tools, rig irons, etc.

Rochester, N, Y.

GOWE, JNO. N., mfrs. of Specialties, such as Machine forging, bridge bolts and trusses, railroad switches, spike, mall, chisels, &c.

ELEVATORS for Hotels, Factories and Private Houses. J. S. GRAHAM & CO.

WOOD-WORKING MACHINERY. Send for Catalogue. J. S. GRAHAM & CO.

RAZOR STROPS. Sole mfrs. of all kinds of Razor Strops. Uischt, Linn & Co. 131 N. Water

Buffalo, N. Y.

SANDS, PAUL, Marine and Stationary Steam Engine Works mfr. of drilling machines, foot and power lathes. 70 Columbia street.

EMPIRE STATE MF'G CO., O. F. Swift, prop'r, manfr of Fluters, Sad Irons, Spun Copper & Half Copper Tea Kettles. Washington, cor. Ohio

WHITE, L. & I, J. manf'r's of Coopers' Tools, Carpenters' Tools, and Ship Tools. Also manf'r's of Planer Knives and Machine Cutters to order. 310, 312, 314 Exchange street.

THE BUFFALO NUT AND BOLT CO. [Limited.] Manufrs. of Hot Pressed Nuts, Bolts, Washers, Rivets, &c. No. 226 Ohio Street.

Rheims, N. Y.

GREAT WESTERN CHAMPAGNE. Finest made in America. Equal to best imported. Has taken highest awards everywhere, and is used all over the Continent. Try a case, and you will have no other. Pleasant Valley Wine Co., Rheims, N. Y.

Brattleboro', Vt,

A JOY FOREVER!

ESTEY ORGANS

Manufactured by

J. ESTEY & CO.,

Brattleboro', Vt.

(Catalogue free on application.)

COATES'

"Independent Lock Lever"

HAY AND GRAIN RAKE.

Patented August, 1867, January, 1875, June, 1875, and November, 1876. 60,000 now in use. Light touch of lever and driver's weight dumps it. Best self-dump in market. Twenty steel teeth. No complicated ratchet wheels, friction bands or other horse machinery needed to operate it. A small boy rakes easily twenty acres per day with the Coates' Lock Lever. Send for circulars.

A. W. COATES & CO.

Alliance, Ohio.

LUMBER.

PLANK, MIXED WIDTHS.
2 inch, 12, 14 and 16 feet, together.

A 1 and 2 uppers	$50
A 3	40
B	32
C	20
D	15
E	12

1¼ and 1½ inch.

A 1 and 2 uppers	$48
A 3	40
B select	32
C	20
D	14
E	12

BOARDS.
One Inch, mixed widths.

A 1 and 2 uppers	$44
A 3	36
B select	30
C	19
D	14
E	12

STOCK BOARDS.
12 Inches wide.

A 1 and 2 uppers	$45
A 3	38
B	32
C	21
D	16
E	13

STRIPS.
6 Inches wide.

A 1, 2, and 3	$42
B	32
C	22
D	16
E	12
Norway Fencing Strips	17
Norway Flooring Strips	25

WORKED LUMBER
FLOORING.

Flooring—A 3	$42
B	35
C	24
D	20
Norway Flooring—A 3	28
C	22
D	18
Matched Drop Siding, 6 inches—A 3	42
B	38
C	24
D	20

Beaded Ceiling $2 higher than Flooring.

One half inch Bevel Siding—A 1 and 2	24
A 3	20
B	18
Ash Flooring—A 1 and 2	40

BILL STUFF.

Small, joists, 12, 14 and 16 feet	$14
Timber, larger than 8x8 special.	
Timber, longer than 18 feet, adds about $1 per foot per M. extra.	
Cedar Posts, large	30 00
" " medium	25 00
" " small	$15 to 20 00

SHINGLES, LATH AND MILL WORK

Shingles XXX	$ 4 25
Clear Butts	3 25
Lath	2 75@3 00

Surfacing, one side, adds $1.25; two sides $1.50
Matching, flooring and drop sidings, $2.50.

LAKE FREIGHTS.

COAL.

Buffalo to Chicago	$.62½@.65
Toledo to Chicago	1.00
Cleveland to Chicago	70@75
Erie to Chicago	70@75
Oswego to Chicago	1.50
Fairhaven to Chicago	1.30
Buffalo to Millwaukee	70@75
Cleveland to "	70@75
Erie to Milwaukee	75
Buffalo to Racine	80
Buffalo to Kenosha	85

IRON ORE.

Marquette to Lake Erie ports	1.25
Escanaba to Lake Erie ports	90@95
Escanaba to Chicago	90@95
Marquette to Chicago	1.15@1.20

Crowl's Patent Iron

Roofing,

For Steep or Flat Roofs.
NO MORE NOISE OR LEAKING.
TIN AND SLATE ALSO FURNISHED.
Agents wanted in every County.
Cambridge Roofing Co.
Cambridge, Ohio. J. E. ANNIS, Sec'

JUDSON'S PATENTED
SECTIONAL
Assay Furnaces
AND APPLIANCES.
Model Furnace for 1881,
All steel, light and durable, with Revolving Grate, etc. Also
Judson's Practical Stoking Attachment
Guaranteed to feed coal, coke or charcoal without choking the draft.
Manufactured only by the patentee,
W. E. JUDSON,
Cleveland, O

Cleveland to New York
In Pullman Cars, via
Cleveland & Pittsburgh and Pennsylvania
RAILROAD.

ON and after Sunday, June 4, 1882, trains leave Cleveland and arrive at the points named below as follows: (Night Express runs daily, all other trains daily except Sundays.)

Blue Grass Route of Ohio

TIME TABLE.

The Cleveland, Mt. Vernon and Delaware RAILROAD.

GEO. D. WALKER, RECEIVER.
Schedule No. 5--Dating from Sunday, June 4.

SOUTH-BOUND TRAINS.

STATIONS.	Accom	Accom	Expr	Mail	Sundays only
Leave.	P. M.	P. M.	P. M.	A. M.	P. M.
Cleveland	5.30	3.45	2.30	8.50	.....
Hudson	6.53	5.02	3.35	10.10	4 20
Cuyahoga Falls	7.11	5.30	3.53	10.29	4 40
Akron	7.23	5.46	4.10	10.42	5 00
*North Portage	P. M.	6.00	4.24	10.54*	6 14
Clinton	.....	6 19	4.44	11.09	5 31
Warwick	.....	6.29	4.49	11.14	5 37
*Marshallville	.....	6.43	5.02	11.27*	5 50
Orrville	.....	6 58	5.14	11.42	6 02
*Apple Creek	.....	7.17	5.32	11.58*	6 22
Fredricksburg	.....	7.32	5.45	12.11	6 37
*Holmesville	Accom	7.48	5.55	12.21*	6 48
Millersburg	7.55	6.08	12.34	7 00	
	A. M.	P. M.			A. M.
Millersburg	5.50	.....	6.08	12.34	7 00
*Killbuck	6.02	.....	6.20	12.47*	7 12
*Black Creek	6.13	.....	6.31	12.59*	7 25
	6.33 ‖	.....	6.51 ‖		
Gann	6.53 ‖	.....	7.11 ‖	1.19	7 47
Danville	7.04	.....	7.20	1.29	7 59
Howard	7.18	.....	7.29	1.38	8 10
Gambier	7.22	.....	7.38	1.47	8 20
Mt. Vernon	7.35	.....	7.51	2.00	8 33
*Bangs	7.45	.....	8.01	2.11*	8 45
*Mt. Liberty	7.53	.....	8.09	2.20*	8 54
Centerburg	8.05	.....	8.18	2.30	9 05
*Condit	8.19	.....	8.32	2.44*	9 19
*Sunbury	8.27	.....	8.40	2.53*	9 28
*Galena	8.32	.....	8.45	2.58*	9 34
Westerville	8.48	.....	9.00	3.15	9 50
Arrive at Columbus	9.15	.....	9.25	3.40	10 20
	A. M.		P. M.	P. M.	A. M.

NORTH-BOUND TRAINS.

STATIONS.	Expr	Mail	Accom	Accom	Sundays only
Arrive at	P. M.	P. M.	A. M.	A. M.	A. M.
Cleveland	1.45	6.55	10.15	8.30	.....
Hudson	12.35	5.48	8.53	7.15	10.30
Cuyahoga Falls	12.16	5.30	8.33	6.58	10.11
Akron	12.03	5.17	8.20	6.45	9.50
*North Portage	11.46	5.00*	8.03	A. M.	9.34
Clinton	11.30	4.44	7.46	.....	9.18
Warwick	11.25	4.37	7.37	.....	9.12
*Marshallville	11.10	4.27*	7.23	.....	9.00
			7.10 ‖		
Orrville	10.57	4.14	6.40 ‖	.....	8.47
*Apple Creek	10.40	3.56*	6.22	.....	8.27
Fredricksburg	10.26	3.43	6.08	.....	8.13
*Holmesville	10.16	3.33*	5.58	Accom	8.02
Millersburg	10.05	3.22	5.45		7.50
			A. M.	P. M.	P. M.
Millersburg	10.05	3.22	.....	8.35	7.25
*Killbuck	9.51	3.08*	.....	8.22	7.13
*Black Creek	9.39	2.57*	.....	8.11	7.00
Gann	9.17	2.36	.....	7.49	6 38
Danville	9.07	2.27	.....	7.39	6.25
Howard	8.58	2.18	.....	7.29	6.14
Gambier	8.49	2.09	.....	7.14	6 03
Mt. Vernon	8.37	1.57	.....	7.02	5.51
*Bangs	8.22	1.40*	.....	6.46*	5.37
*Mt. Liberty	8.14	1.31*	.....	6.37	5.28
Centerburg	8.05	1.22	.....	6.28	5.17
*Condit	7.51	1.09*	.....	6.14	5.03
*Sunbury	7.42	1.01*	.....	6.06	4.53
*Galena	7.37	12 56*	.....	6.00	4.47
Westerville	7.20	12.40	.....	5.43	4.30
Leave Columbus	6.55	12.15	.....	5.15	4.00
	A. M.	P. M.		P. M.	P. M.

* Stop on signal. B Breakfast. S Supper.
Special Round trip rates will be made for Sunday trains.

N. MONSARRAT, Gen'l Supt. Akron, O
E. T. AFFLECK, General Passenger Ag't, Columbus, O.

TAKE THE
BEE LINE ROUTE
POPULAR THOROUGHFARE
BETWEEN THE
EAST AND WEST.
No Midnight Changes!
No Emigrant Trains!
Connections in Union Depots for all Points.

☞ The unequalled facilities offered by this Company for luxurious travel are
Elegant, easy riding, Day Coaches,
Elegant Wagner and Woodruff Drawing Room and Sleeping Cars.
Elegant Horton Reclining Chair Cars, between Lake Erie (Cleveland,) and the Mississippi River, (St. Louis) FREE.

Model Hotel cars attached to Express Trains, which together with a track and road bed of known excellence, you are assured Comfort and Safety with

FAST TIME!

☞ Bear in mind that our through car routes are numerous and excellent, a great convenience to all travelers.

Consult your best interests by asking for and securing a Ticket via the Bee Line. For Maps, Time Tables, and other information, call on

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O. B. Skinner, Traffic Manager.
A. J. SMITH, Gen'l Pass. Ag't.

LOVEGROVE and CO.,
Manufacturers of
BOILERS & ENGINES
All Sizes,
152 N. 3rd st., Philadelphia, Pa.
Write or Price List.

TRAVELERS' REGISTER.

Lake Shore & Michigan Southern.

Trains marked with a * are the only trains that arrive and depart in this city on Sundays.

ARRIVALS.	a.m.	a.m.	p.m.	p.m.
Through from East	*2 50	*6 35	1 25	*1 40
Through from East	.....	.....	.....	*7 05
N. Y. & Chicago Ex	.....	12 23	.....	.....
Conneaut Accommoda'n	8 40	.....	.....	.....
Nottingham Accom'd'n	†10 05	.....	†4 45	.....
Elyria Accommodation	8 50	.....	.....	.....
From West via Sandusky	*7 05	11 00	.....	10 12
Fast Express	*1 35	.....	.....	.....
From West via Norwalk	.....	11 00	2 25	10 10
Pt. Clinton Accom'dat'n	.....	11 00	.....	.....
DEPARTURES.	a.m.	a.m.	p.m.	p.m.
Through Eastern Train	*7 30	11 15	*2 55	10 35
Fast N. Y. Express	*1 50	.....	.....	.....
Conneaut Accommod'n	.....	.....	4 50	.....
Nottingham Accom'd'n	†9 00	.....	12 15	.....
Elyria Accommodation	.....	.....	5 00	.....
West via Norwalk	6 40	.....	3 30	*7 35
West via Sandusky	8 05	7 00	*2 05	5 00
N. Y. & Chicago Ex	.....	12 33	.....	.....
Pt. Clinton Accom'dat'n	.....	.....	5 00	.....

Cleveland, Columbus, Cincinnati & Indianapolis.

ARRIVALS.

No. 2 Col. & Cin. & Ind'pous Ex.	*7 10 A.M
No. 8 C. T.V. & W. & Clev. Accom	10 30
No. 12 St. Louis & New York Exp.	*3 00 P.M
No 6 Indianapolis & Columbus Exp	10 20
No. 10 Wheeling & Cleveland Exp.	7 15
No. 4 Special Cin. & New York Exp	*3 40

DEPARTURES.

No. 1 Cincinnati & Columbus Exp.	8 00 A.M
No. 11 Cleve, Indianap. & Wheel'g Ex.	7 10
No. 3 Special St. Louis & Cincinnati Ex.	1 55 P.M
No. 5 Night Express,	*7 25
No. 7 C. T. V. & W. & Col. Accom	4 00

†This train runs daily to Indianapolis and St. Louis, and daily, except Sunday, to Cincinnati.

Cleveland, Tuscarawas Valley & Wheeling.

ARRIVALS.

Wheeling & Cleveland Express	8 25 P.M
Uhrichsville Express	10 30 A.M

DEPARTURES.

Wheeling & Cleveland Express	7 15 A.M
Uhrichsville Express	4 00 P.M

New York, Pennsylvania & Ohio.

ARRIVALS.

No. 7 Mahoning Valley Accommo.	10 55 A.M
No. 3 New York Express,	*7 00 P.M
No. 1 New York Express,	6 50 A.M
No. 3 Pittsburgh Express,	*7 00 P.M
No. 5 Pittsburgh Express,	2 00
New York Express	2 00
No. 9 Youngstown and Pitts. Local	10 15

DEPARTURES.

No. 12 New York Express,	*7 10 A.M
No. 4 Youngstown Local,	11 00
No. 8 Mahoning Accommodation,	4 25 P.M
No. 2 New York Express,	10 45
No. 12 Pittsburgh Express,	*7 10 A.M
No. 6 Pittsburgh & Main Line Express	2 30 P.M

Cleveland & Pittsburgh.

	ARRIVE.	DEPART
Pittsburg & Wheeling	1 45 P.M	8 50 A.M
Express	6 55	2 30 P.M
Alliance Accommodation	10 15 A.M	3 45
Ravenna Accommodation	8 35	5 35
Night Express	6 30 A.M	†11 40 P.M

† Night Express runs daily, except Saturday, by way of Wellsville, and on Saturday by way of Alliance.

Valley Railway.

ARRIVE.	DEPARTURES.
No. 2 Accom... 10 15 A.M	No. 1 Mail ... 8 15 A.M
No. 6 Express... 1 35 P.M	No. 3 Accom. 2 30 P.M
No. 4 Mail ..... 6 30 P.M	No. 5 Exp..... 6 05

Special trains leave on Sunday at 8.30 A. M. and 4.20 P. M., arriving at Cleveland at 10 A. M. and 6.25 P. M.

Trains leave from Depot foot of South Water Street.

Connotton Valley Railway.

Arrive.	Depart.
No. 1 ..... 10 05 A.M	No. 4 ..... 10 05 A.M
No. 3 ..... 4 00 P.M	No. 2 ..... 4 40 P.M

All trains arrive and leave depot corner Commercial and Fifth Streets

Cleveland, Akron & Columbus Railroad,

Cleveland, Akron & Columbus Railroad, running over Cleveland & Pittsburgh Railroad to Hudson, for Akron, Columbus, etc.

	ARRIVE.	DEPART.
Mail	1 15 P.M	8 00 A.M
Express	7 25	1 50 P.M
Accommodation	10 10 A.M	3 45 P.M

CLEVELAND & PITTSBURGH

RAILROAD.

Trains leave Cleveland and arrive at the points named below as follows: Night Express runs daily, all other trains daily except Sundays.

	Mail.	Fast Line.	Accom.	Night Expr'ss.
Leave Cleveland	8 50 am	2 30 pm	3 45 pm	11 40 pm
Arrive Hudson	10 00	3 28	4 50	12 50 am
Ravenna	10 40	3 58	5 50	1 18
Alliance	11 25	4 25	6 05 pm	2 05
N. Philadel	11 35 pm	7 15	.....	10 55
Salem	12 25	.....	.....	3 02
Canton	12 28	5 47	.....	3 20
Massillon via Alliance	12 50	6 06	.....	3 38
Akron	10 42 am	4 10	5 40 pm	.....
Pittsburgh	3 30 pm	7 45	.....	6 55
Wheeling	5 10	8 00	.....	8 55
Marietta	8 45	.....	.....	.....
Harrisburg	.....	4 15 am	.....	4 00 pm
Philadelphia	.....	7 50	.....	7 35
New York	.....	11 15	.....	10 35
Baltimore	.....	7 55	.....	7 20
Washington	.....	9 17	.....	8 47
Boston	.....	8 00 pm	.....	.....

Ravenna Accommodation leaves Cleveland at 5:30 p m, reaching Ravenna at 7:15 p m; Akron 7:23 p m.

Newburgh Accommodations leave Cleveland at 11:00 a m and 12:30 pm. Returning, leave Newburgh at 11:10 am and 1:30 pm.

Passengers for New York, Philadelphia, Baltimore, Washington, and all points east of Pittsburgh make but one chang of cars, viz. at Union Depot, Pittsburgh, excepting those leaving on the Fast Line which has Pullman Sleepers from Cleveland to Philadelphia and New York.

The Fast Line leaving at 2:30 P. M. has elegant Pullman Palace Sleeping Cars through from Cleveland to New York without change. Pittsburgh Passengers who desire Parlor Car accommodations can secure seats in this car.

The Night Express has Pullman Sleeping Cars from Cleveland to Pittsburgh which can be occupied by passengers at Union Depot, Cleveland, any time after 9:00 P. M. At Pittsburgh passengers can take elegant through Parlor or Sleeping Cars for the East.

Sleeping and Parlor Car accommodations from Cleveland and Pittsburgh eastward can be secured at the Union Sleeping and Parlor Car Office Union Passenger Depot; of H. C. Marshall, Union Ticket Office, Weddell House; or of the Ticket Agent at the Euclid Avenue Station.

Through tickets can also be secured at the same points. Baggage checked through from the Union Depot or from Euclid Avenue Station,

By the 8:50 A. M. train a through car leaves daily for Akron, Gambier, Mt. Vernon, Columbus and immediate points, without change.

The 2:30 P. M. train has through car for Akron, Orrville, Columbus and immediate points, arriving in Columbus at 9:25 P. M.

By the 3:45 P. M. Accommodation train cars run through without change from Cleveland to Cuyahoga Falls, Akron and Millersburgh,

Night Express leaving Cleveland at 11:40 P. M., runs daily, and makes connection at Wellsville for Steubenville, Bridgeport, Wheeling, Bellaire and intermediate points. Every night in the week except Saturday the night express runs via Wellsville. On Saturday nights it runs via Alliance. All other trains run daily except Sunday.

Trains arrive at Cleveland.—Night Express at 6:30 P. M., having Pullman Sleeper from Pittsburgh; Ravenna Accommodation, 8:35 A. M., Alliance Accommodation, 10:15 A. M.; New York Wheeling & Washington Mail, with Pullman Sleeping Car from New York and Philadelphia, 1:45 P. M.; New York, Philadelphia & Wheeling Express, 6:55 P. M.

WM. A. BALDWIN, General Manager.
E. A. FORD, Gen'l Pass. & Tkt. Agt. Pittsburgh, Pa.
C. L. KIMBALL, District Passenger Agent, corner Bank and St. Clair streets, Cleveland.

Cleveland to New York,

VIA THE
NEW YORK, PENNSYLVANIA AND OHIO RAILROAD.

Formerly Atlantic & Great Western Railroad.]

For New York, Boston and the East. The shortest and quickest route to Pittsburgh, Washington, Baltimore and the Southeast

Until further notice trains will leave the new Central Depot, South Water Street and Viaduct, as follows:

7:10 A.M. LIGHTNING EXPRESS, (daily,) sleeping and hotel coaches from Leavittsburg. 8:55 a.m. To New York, Albany and Boston without change. Parlor car, Cleveland to Salamanca. Arrives at Meadville 11:20 a.m., (dinner); Franklin, 12:33 p.m.; Oil City, 1:00 p.m.; Corry, 1:00 p.m.; Jamestown, (Lake Chatauqua) 1:57 p.m.; Buffalo, 6:15 p.m.; Rochester, 8:30 p.m.; Hornellsville, 6:40 p.m., (supper); Corning, 8:25 p.m.; Elmira, 8:57 p.m.; Binghampton, 10:58 p.m.; Albany, 6:00 a.m.; Boston, 2:45 p.m.; arriving at New York, 6:50 a.m.

10:45 P.M. NIGHT EXPRESS, (daily except Sunday), Sleeping Coach from Leavittsburg to New York without change. Arrives at Youngstown 1:45 a.m.; Meadville, 3:30 a.m.; Corry, 5:20 a.m.; Jamestown, 6:22 a.m.; Buffalo, 9:45 a.m.; Rochester, 1:10 p.m.; Hornellsville, 11:20 a.m.; Corning, 12:53 p.m.; Elmira, 1:21 p.m.; Binghampton, 2:50 p.m.; New York, 9:25 p.m.

2:30 P.M. PITTSBURGH EXPRESS,—daily, through without change. Parlor Car, Cleveland to Pittsburgh, arrives at Youngstown, 5:00 p.m.; Pittsburgh, 7:48 p.m.; Washington, 7:30 a.m.; Baltimore, 8:15 a.m.; via Sharon and Sharpsville to Meadville 7:40 p.m.; Corry, 9:10 p.m.; Lakewood, 9:50 p.m.; Jamestown, 10:00 p.m.; Salamanca, 11:10 p.m.

4:25 P.M. MAHONING ACCOMMODATION, stopping at all way stations. Arrives at Youngstown, 7:25 p.m; Sharon, 8:30 p.m; Sharpsville 8:40 p.m; connects at Leavittsburg with train No. 20 for Meadville and intermediate points, arrives at Meadville, 11:05 p.m. Pittsburgh, 10:48 p. m.

7:10 A.M. PITTSBURGH EXPRESS,—(daily) through without change. Arrives at Youngstown, 9:50 a.m.; Sharon, 10:55 a.m.; Sharpsville, 11:05 a.m.; Pittsburgh, 12:45 p.m. Returning, leave Pittsburgh, 4:48 a.m., 8:33 a.m., and 1:13 p.m. and 4:20 p.m.

11:00 A.M. YOUNGSTOWN & PITTSBURGH Accommodation, stopping at all Way Stations, arriving at Youngstown 1:50 p.m.; Pittsburgh, 6:10 p.m. Trains arrive at Cleveland, 6:50 a.m., 10:55 a.m. 2:00, p.m. 7:00 p.m., and 10:15 p.m.

☞ This is the only route by which passengers can reach Corry, Elmira, Binghampton, New York City, and intermediate points WITHOUT CHANGE. No change to Boston and New England cities.

Baggage Checked Through to All Points East

☞ Through Tickets and information regarding the route can be obtained at the Union Ticket Office, corner Bank and Superior streets; at office 131 Bank street, and at new Depot of New York, Pennsylvania and Ohio Railway, South Water street and Viaduct, Cleveland.

A. E. CLARK, Gen. Pass'r. Agt., Cleveland, Ohio.
M. L. FOUTS, Pass. Agt., 131 Bank st., Cleveland.
P. D. COOPER, Gen. Man'gr, Cleveland.

NOTICE.—Hereafter all Passes must be returned to the General Passenger Agent within FIVE DAYS after date of expiration; otherwise they will be discontinued.

MERCHANT & COMPANY,

Manufacturers of

SOLDER,

525 Arch St., Philadelphia.

WE ASK THE PATRONAGE OF THE TRADE FOR OUR SOLDER FOR THE FOLLOWING REASONS:

1st.—All our Solder is made on our premises and under our personal supervision.

2nd.—We guarantee proportions specified or do not require payment.

3rd.—We use nothing but best selected brands of new Lead and Pig Tin.

4th.—We do not use animony or any other metal to dress up the face of Solder.

5th.—We offer to make any specified mixture of Tin and Lead, guaranteeing same.

6th.—That we believe the question between manufacturer and consumer of Solder is not so much price as quality.

7th.—That we believe our M. F. Solder is the best ever offered to the trade, and cannot be surpassed.

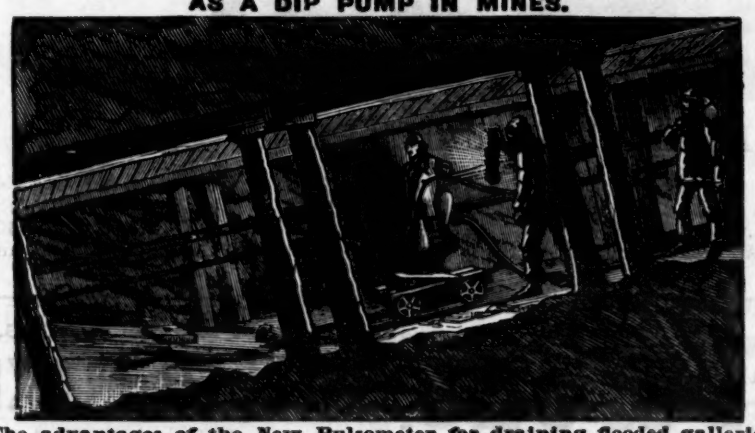
8th.—That we guarantee our prices as low for same quality as any house in the country.

MERCHANT & CO.

THE NEW PULSOMETER

AS A DIP PUMP IN MINES.

CAPACITY FROM 2 TO 500



TONS OF WATER PER HOUR.

The advantages of the New Pulsometer for draining flooded galleries in Mines and Collieries must be apparent to all.

There is no exhaust steam to be conducted out of the mine as it is utilized in the pump to induct the water through the suction pipe. There is no intricate machinery to look after and to break by being knocked about.

"Is ahead of our expectations. As a dip pump it is the superior of them all."—*Waddell & Co., Pittston, Pa.* "The two No. 9's New Pulsometers are working satisfactory."—*G. R. Wilson, Tompkins' Shaft, Pittston, Pa.* "We regard it much cheaper and better than a piston pump."—*Perry & Co., Briar Bluff, Ill.* "Will throw more water with the same amount of steam than a piston pump."—*J. Pickands & Co., Miners' Supplies, Marquette, Mich.* "Works to our entire satisfaction, requires no attention."—*Northumberland Iron and Nail Works, Northumberland, Pa.* "We cheerfully recommend it as a pump; economical in its working and reliable."—*Howard Iron Works, Howard, Pa.*

Descriptive book with prices and testimonials mailed upon application to

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Manufacturers of

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A full line of Carriage and Plow Hardware kept in stock.

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ST. LOUIS, 609 North Third st.
NEW ORLEANS, 142 Gravier st.

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Manufacturers of

Machinist Tools, Milling Machines, Die Sinkers, Universal Heads,

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Glazed Windows.

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Handy Desk Pad

Combines inking cushion, of best material; cast iron japanned case, highly ornamental; ink distribution from the ink bottle direct; no overflow; no soiling fingers; perfect protection from dust; great durability. This Pad is the neatest and most satisfactory in the market. Will be sent to any address on receipt of **Price $1.50.**

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[Patent applied for.]
Good Agents Wanted to sell Handy Desk Pad.

THE HANCOCK INSPIRATOR

IS THE

INJECTOR PERFECTED,

IT IS THE

BEST BOILER FEEDER KNOWN,

And more of them have been sold during the past year than all Injectors in the market combined.

Thirty Days Trial to Responsible Parties.

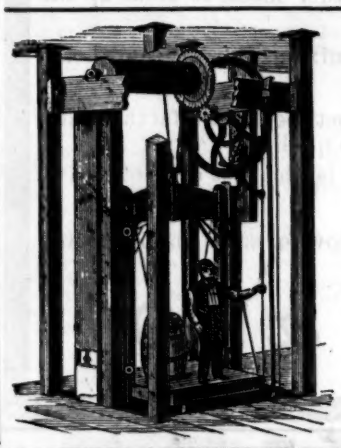
Persons making, using, or dealing in Duplex Injectors, or Double Injectors, are hereby notified that all such Injectors in which a lifting jet apparatus raises or supplies water continuously to a forcing jet apparatus, are claimed, by the HANCOCK INSPIRATOR COMPANY, to infringe one or more patents owned by it.

On the 23d of June a suit in chancery was commenced by it against James Jenks, of Detroit, Mich., for making and selling the "Duplex Injector," so-called. Other infringers will be promptly sued.

The Inspirator Company will defend all who use or deal in the Hancock Inspirator against any suits which allege it to be an infringement of any patent.

THE HANCOCK INSPIRATOR CO.
H. M. WHITNEY, President, Boston, Mass.

Fairbanks, Morse & Co., Special Agents.
CLEVELAND, OHIO.



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OTTO SILENT GAS ENGINE,
From 1 to 25 horse power.

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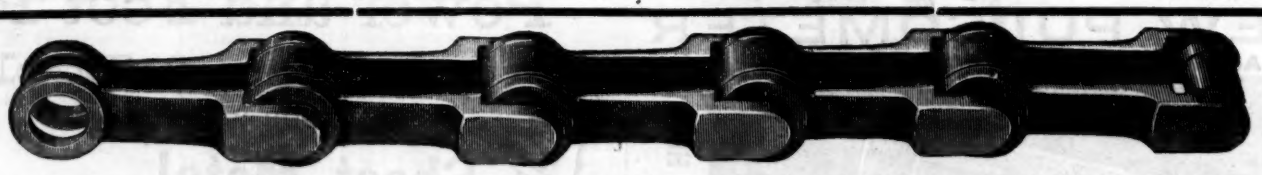

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CHAIN BELTING FOR TRANSMITTING POWER. The only medium made that will transmit so nearly ALL the power applied. No slipping nor lost motion. Especially adapted for driving HEAVY SHAFTING, ROLLER TRAINS in ROLLER and RAIL MILLS, TRACTION ENGINES, AGRICULTURAL MACHINERY, ELEVATORS, DRAGS, HOISTS, DREDGING MACHINES, LIFTING CRANES, ELEVATING NUT, SLACK and PEA COAL, SAWDUST and TAN BARK CARRIERS, &c. Etc., &c., manufactured and sold by the **LECHNER MANUFACTURING CO., Columbus, O.** Also manufacturers of the LECHNER COAL MINING MACHINES, and power ROTARY COAL DRILLS. For further information send for Circulars.

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Specialty of Portable Saw Mills and High Speed Engines.

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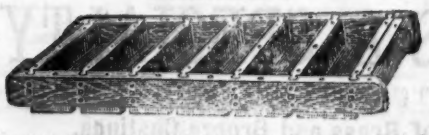
D. J. C. ARNOLD,

Manufacturer of



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All goods first class. Orders and correspondence solicited. NEW LONDON, O.

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Black Birch Carriage, Wagon and

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Sizes from 3½x6½ to 18x22.

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For Machinery and Rolling Mills.

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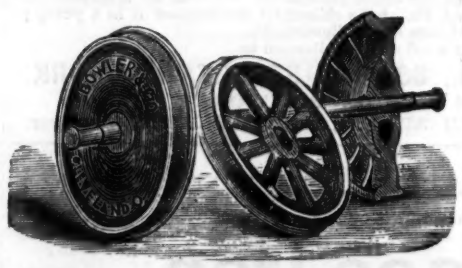

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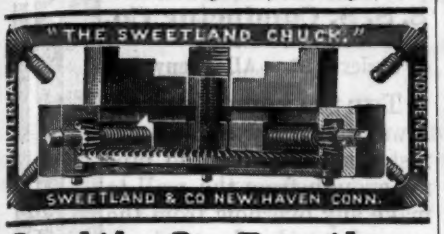

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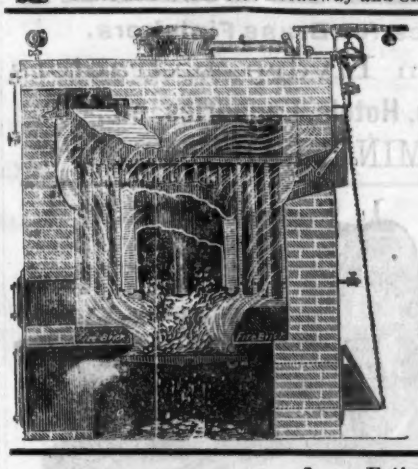

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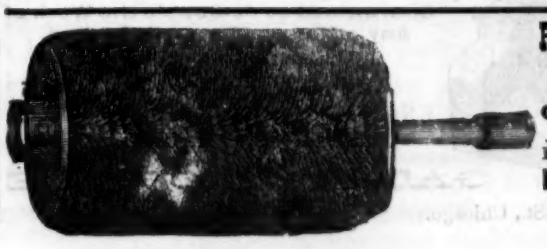

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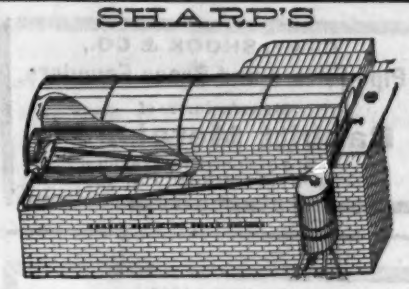

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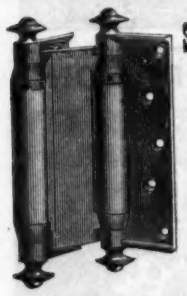

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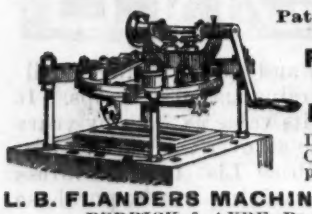

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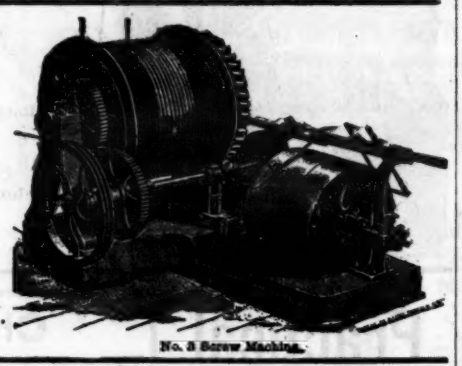

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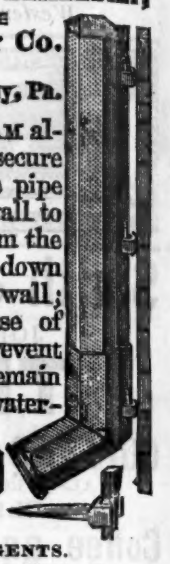

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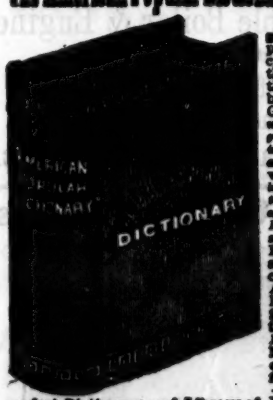

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